SKYWAYS

MILITARY ★ CIVIL ★ COMMERCIAL AVIATION

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9K-485
10-50
CHICAGO UNDERGRADUATE
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Yes, PIPER Builds Best!

For GREATER PERFORMANCE and MORE PAYLOAD

For MAXIMUM STRENGTH and LONGER LIFE

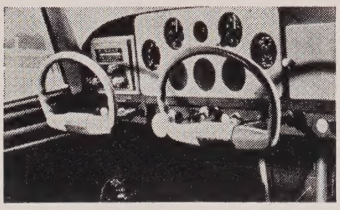
For LOWER INITIAL COST and BETTER SERVICEABILITY

Have you ever wondered why Piper planes achieve such remarkable performance and payload-carrying ability—and why you get so much more for your money? It's because the Piper type of construction gives far more than required strength for less structural weight and is less costly to build.

The welded *steel* fuselage of bridge-like construction and wings with aluminum I-beam spars and ribs cannot be matched for year-in and year-out stamina. And the tough, resilient outer skin, treated with newly developed and greatly improved finishes, is equally superior for serviceability and economical repair.

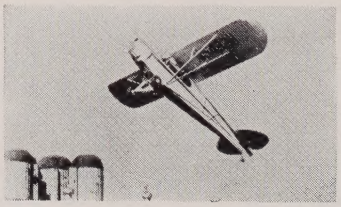
With a Piper you pay less in the beginning, less for maintenance and carry a greater useful load on less horsepower. Just a few of the reasons why more Pipers have been sold than any other make of personal airplane.

Now! EVEN MORE UTILITY, ECONOMY, PERFORMANCE IN THE 1950 PIPER MODELS



THE FOUR-PLACE 134 MPH PACER

You'll be proud to own the Pacer (shown above) not just for its outside beauty and smart interior styling but because you can "walk by" most other personal airplanes. The Pacer cruises up to 134 mph! Economical "115" has 115 horsepower, soft-riding Hydrasorb landing gear, front and rear doors, two 18 gallon wing tanks. Models "125" and "135" have 125 horsepower, flaps and added sound-proofing. Prices start at $3,295.



THE SENSATIONAL SUPER CUB

The 2-place Super Cub takes off and lands shorter than any plane available today. Perfect for agricultural work, airport operations and personal flying. Flies as slow as 33 mph; can take off and land in less than 150 feet. Floats or 4-wheel gear optional. Cruises over 100 mph. Available with dust or spray equipment. Model "95" has 90 hp, Continental; "105" has 108 hp, Lycoming. Prices start at $2,795.

HOW ABOUT A TRADE? If you now own a 2-place plane why not trade it for a 4-place Pacer and its greater utility? Our representative will be glad to inspect and evaluate your plane for trade. Easy monthly payments arranged. Write for brochure on Pacer and Super Cub. Dept. SK-8

PIPER

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The Birdmen's Perch

No go too slow, too low!

Stalls are bad enough anytime, but at low altitudes they're poison. No matter how interested we get in the scenery, it's no fun to see it coming up at us so fast!

That's why we're so hepped up over a

new device we read about that's going to sell like hot cakes if pilots are the smart guys we think they are.

It's an automatic stall reminder—a horn that lets the pilot know when he's about to go into a stall. That's for us, Brother, and it should be for you!

Sorry we can't give you more info at the moment, but suggest you make some inquiries yourself. It's our bet that this little gadget is going to prevent the ruination of lots of nifty little ships and plenty of pilots.

In our book, it's an A Number 1 necessity!

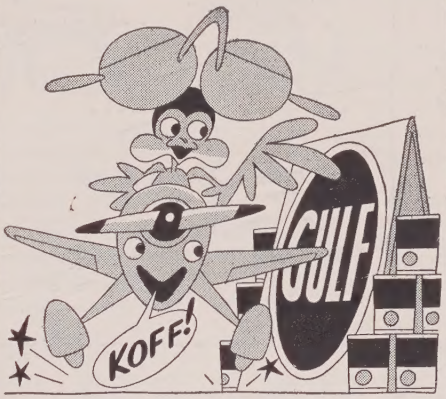
MAKE WITH THE COMMERCIAL, FERDIE!

But if you gotta stall, do it on the ground and in front of that fancy orange and blue "GULF" sign!

The good-looking fellow in the coveralls is just dyin' to fill your crankcase with a product he's been plugging called Gulf Aviation Oil—Series D!

Did we say product? Why Gulf Aviation Oil—Series D—is practically an institution, the world's finest detergent dispersant oil for horizontally opposed engines.

We don't want to brag, but Gulfpride is the only aviation oil put through Gulf's exclusive Alchlor process to remove those extra carbon and sludge formers.



Great Scott, Man, get some! Increase those periods between overhauls up to 100%!

LITTLE KNOWN FACTS DEPT.

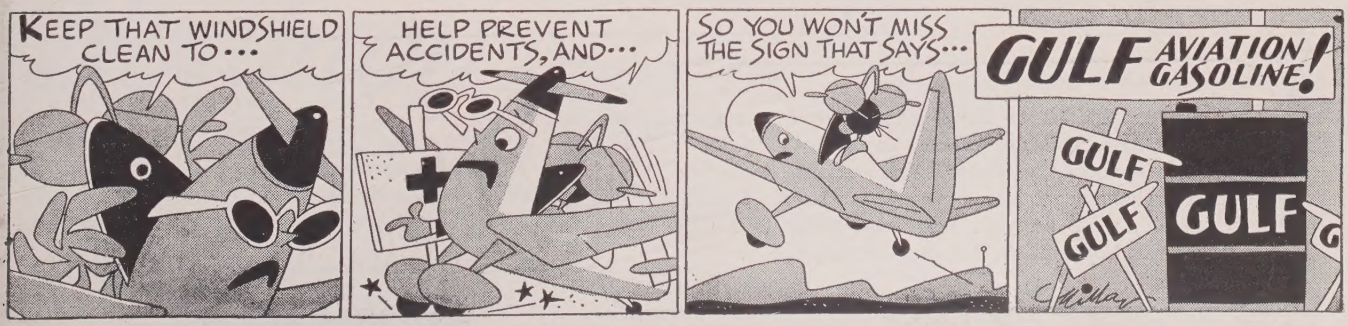
What! You never heard of Donald Van Landuyt, 1420 West 10th Street, Bend, Oregon?

Well, you will from now on because Don has just earned great distinction and a shiny new Commission of Perch Pilot (bottom rung, of course) for submitting, with PROOF, a Little Known Fact that may account for the paper shortage! To wit:

Blueprints required for a big Air Force bomber would cover 125 football fields!

Fine, Don, absolutely fine! It's facts like these that restore our faith in football. Now—be a good fellow and tell the other boys and girls how much fun it is to be famous.

GULF
AVIATION PRODUCTS



Gulf Oil Corporation... Gulf Refining Company...

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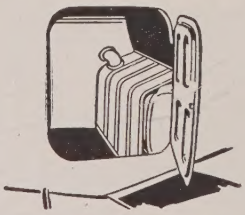
Hitch your business to this star performer . . .

Stellar take-off and landing performance

Short fields are no problem! New Beechcraft propeller develops greater static thrust. Flap travel is increased; action is faster.



Plan *long* flights — you have the range!

The Bonanza's 750-mile range can be increased to 940 or 1,145 miles by installation of 10-gallon or 20-gallon auxiliary fuel tanks.

the Beechcraft BONANZA

Beechcraft Bonanzas serve as company-owned planes in almost every field of American business. More than 2,400 are now delivered. They slice travel time by two-thirds; give key men the incalculable advantage of any-time mobility. *Features* put this trim, exceptionally fast plane at the "head of the class"; make it *the* outstanding buy. Here are just a few of the features that make this greater-than-ever Beechcraft a better-than-ever value.

Extra style and comfort features

Touches of luxury: four arm rests, four individual ash trays, special coat hanger rod to carry clothes with never a wrinkle.

Take-off horsepower rating increased

Now 196 h.p. at 2,450 rpm. Landing gear action speeded up: lowered in 7½ seconds, raised in 8½ seconds at 105 mph.

Room for *all* the luggage you need!

Baggage compartment is accessible from inside or out. Room, too, for four big people in the smartly tailored *quiet* cabin.

Sturdy framework gives you unsurpassable safety

All-metal framework is stronger than conventional construction. Exceptionally rugged: Shock, stress tests far surpass CAA requirements.

There's more to the Bonanza story! Let your nearest Beechcraft distributor or dealer "fill you in" on facts about the Model B35 Beechcraft Bonanza's exceptional economy in operation. Or for more information, write on your letterhead today to Beech Aircraft Corporation, Wichita, Kansas, U.S.A.

Top speed, 184 mph
Cruising speed, 170 mph
Range, 750 miles
Fuel economy, 9.5 gph

Beechcraft BONANZA

BEECHCRAFTS ARE THE AIR FLEET OF AMERICAN BUSINESS

His Aviation Career Has Begun...

Quoted from one of many recent letters from NAI-trained Aeronautical Engineers

...When Will You Start Your Advancement Toward Success?

You must have heard of the special advantages of training at *Northrop*—the practical training in fundamentals, the skilled guidance in advanced aeronautical subjects, and the inspirational association with one of the great aircraft companies of the world.

But do you know the proved results of *Northrop* training? We wish you could see our files of grateful letters from hundreds of our graduates—*men like yourself,* men with the vision to see the satisfying rewards and the great opportunities in store for career-trained Aeronautical Engineers. They are men who took *action* to assure themselves *good pay, interesting work,* and a *secure future.*

See for yourself the Record of Northrop Graduates... Here in cold black and white are the facts on *Northrop* graduates over a period of 18 months. This "Graduate Employment Report," compiled by the *Graduate Placement Department* of Northrop Aeronautical Institute is a printed record of the constant demand for *Northrop*-trained men throughout the Aviation Industry.

THESE MEN TOOK *ACTION*... and are now profiting from their Northrop career-training.

*Jim R. "Thanks to you for starting me off on this immensely interesting field of helicopters. For your satisfaction and mine, too, J (another Northrop graduate) and I received a healthy raise the 15th of April."

*Robert B. "I wanted to let you know how much I appreciate your help in securing this position. I work in the Missile Flight Test and Analysis Department and am very satisfied with the type of work. Mr. (another Northrop graduate) is also employed in the same department, and Mr. (still another Northrop graduate) of my own class is here but in another department. We're looking forward to seeing future Northrop graduates down here."

*Roy B. "I have been working for (name of aviation firm) and have been putting in some terrific overtime. We manage all the way up to 70 hrs. a week and it doesn't make anyone angry either, with time-and-a-half and double time."

*These are actual quotes from only a few of the letters on file in the N. A. I. Graduate Placement Department. Names are abbreviated out of respect for personal privacy.

LEARN THE REWARDS AERONAUTICAL ENGINEERING OFFERS YOU! Send today for a copy of the *Northrop* Graduate Employment report mentioned above. You will also receive the big, well-illustrated Northrop catalog, which is packed with information on the fascinating subject of *Aviation.* Read this factual data—THEN make your choice of the career that offers you the greatest opportunities for satisfying success.

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Please send Graduate Employment Report, Catalog, and schedule of starting dates of classes. I am interested in: ☐ Aeronautical Engineering ☐ Aircraft & Engine Mechanics

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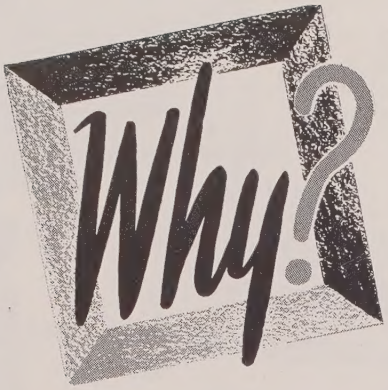

QUESTION:

Why do thousands of transient flyers stop at SAC enroute cross-country (many of them going out of their ways to do it)?

ANSWER:

Because they have found no substitute for SAC's friendly, courteous service. Whether here for a major overhaul or just for a "rest stop", they can count on . .

PILOT'S LOUNGE

The "Eagles' Nest", with full facilities for rest and recreation, is always open to visitors.

REST ROOMS

Clean, modern, convenient.

"SUPER SERVICE"

Attendants meet you on our 25-acre concrete ramp, help you with baggage and information, tidy up your plane, drive you to any point on the airport.

REFUELING

You can get quick, careful refueling service from our big fleet of Texas Company and Humble trucks.

. . . Wherever you are and wherever you may be going, you will be pleased with SAC's service! That's our pledge. We've kept it since 1932. Let us help you on your next cross country.

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SKYWAYS

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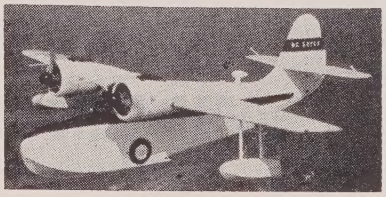
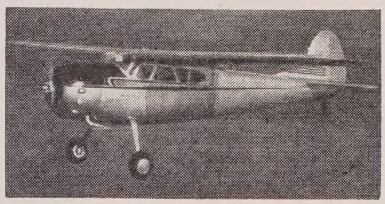
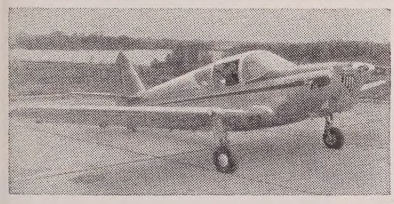
DOUGLAS A26'S—4 FOR SALE—$45.000 UP. #60191S has 169 hours total. Hydromatic propellers. Best airline equipment throughout. Oxygen. Beautiful ten passenger soundproofed interior. 4 reclining seats. Couch. Table. Lavatory. Thermos jugs. Converted by Spartan. April license. Top condition. Asking $87,000. Offers considered. For details consult **POWERS & GEORGE.**



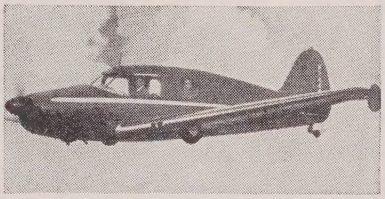
GRUMMAN GOOSE AMPHIBIANS—6 FOR SALE—#62294S was completely rebuilt in December 1948 and zero time factory majored engines installed. De-icing piping. New Sperry automatic pilot and ADF. Gyros. Beautiful new interior. 4 reclining chairs. 2 corner seats. Lavatory. Never in salt water. New condition. Asking $33,500. For details consult **POWERS & GEORGE.**



CESSNA 195'S—7 FOR SALE—#3785VS is a very late 1948 ship. 250 hours total time. Airplane is owned by original purchaser, and has always been hangared, and has never been damaged. Best maintenance. Asking price $9000. Make offer. For further details, inspection, and demonstration on this and other Cessna 195's consult **POWERS & GEORGE.**

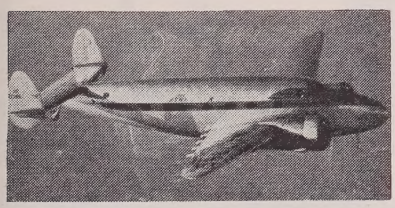


SWIFT 125'S—22 FOR SALE—$1675 UP. Beautiful 1948 Temco, #3175KS, has only 148 total hours. Aeromatic propeller with spinner. Auxiliary gas tank. Mufflers. Steerable tailwheel. Plastic seat covers. Primary blind instruments with gyro compass. Two-way radio. All bulletins. March license. Bargain. $2250. For further details and location consult **POWERS & GEORGE.**

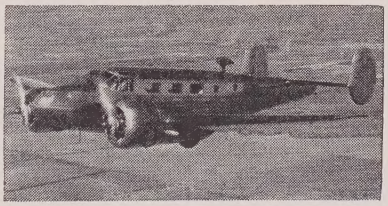


BELLANCA CRUISAIRS—19 FOR SALE—$2625 UP. 1947, #77433S, is red with cream trim. Outside baggage door. 210 total hours. Mufflers. Steerable tailwheel. Aeromatic propeller. Two-way radio. Ship clean and bright. January license. All bulletins. Asking $3250. Make offer. For complete information, location, inspection, and demonstration consult **POWERS & GEORGE.**

BEECHCRAFT BONANZAS—42 FOR SALE—$5500 UP. 1949 heavy skinned model A-35, #8822AS, is painted. 350 total hours. Full gyros. Two radios. Beautiful new condition. Will relicense on sale. Asking $8800. Also; 1948 unpainted A-35 Bonanza, #606B, with 218 hours. Two radios. Excellent. $8000. Offers considered. For further details consult **POWERS & GEORGE.**

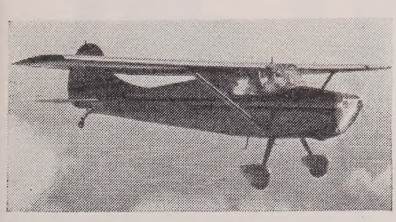


LOCKHEED LODESTARS—10 FOR SALE—$11,000 UP. Beautiful executive transport, #63415S, has 2 plush cabins. 150 hours on majored engines. 2 extra engines, one with zero time. Hydromatic propellers. Anti-icing and de-icing. Exceptional airline instruments and radio including auto pilot, new omnirange, VHF, and ADF. $39,000. Make offer. Consult **POWERS & GEORGE.**

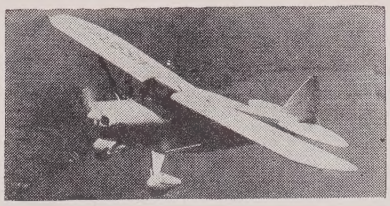


BEECHCRAFT D18S TWINS—10 FOR SALE—$28.000 UP. Our #47 was delivered October 1947. Two-tone green interior. 3 chairs and couch. Special soundproofing. Engines zero and 240 hours since overhauled. Hydromatic propellers. Airline instruments. Best complete Bendix airline radio. ADF. Ship to shore telephone. Relicensed. $32,000. Consult **POWERS & GEORGE.**

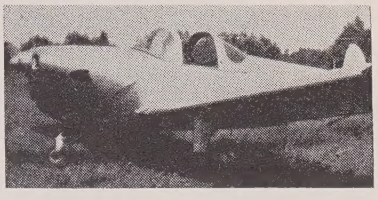
NAVIONS—44 FOR SALE—1949 Ryan, #4165KS, has only 155 hours. Full gyros. Repainted green and cream. Relicensed February. Beautiful new condition. Bargain. $8700. Also; North American, #9470IS, with new 1949, 235 hour, 205 HP engine. Full gyros. New tires, soundproofing, and upholstery. Relicensed April. $4200. For complete information consult **POWERS & GEORGE.**



CESSNA 170'S—25 FOR SALE—1948, #2901VS, is painted silver with green trim. 220 hours total on airplane. 150 hours on new engine. Metal propeller. Primary blind instruments. Two-way radio. Original owner. Hangared always. Clean condition inside and out. Relicensed May. All bulletins. $3400. For details, inspection, and demonstration consult **POWERS & GEORGE.**



PIPER CLIPPERS—9 FOR SALE—#5955HS was delivered new in June 1949, and has been flown 150 hours. Ship has complete electrical system, mufflers, metal propeller, two-way radio, and stall warning indicator. Always hangared. Never damaged. Original owner. Asking $2500. Make offer. For further details, location, and inspection consult **POWERS & GEORGE.**



ERCOUPES—52 FOR SALE—$900 UP. 1947, #97675S, has 112 hours. Metal propeller. Improved trim-tab and throttle. Sensitive altimeter. Two-way radio. $1675. Make offer. Also; 1946, #2621HS, with 145 hours. Aeromatic propeller. Primary blind instruments. Stall warning. Recording tachometer. Two-way radio. Loop. Exceptional offering. $1350. Consult **POWERS & GEORGE.**

ALL TYPES OF AIRPLANES AVAILABLE—DETAILS UPON REQUEST—LISTINGS SOLICITED

WORLD LEADER IN JETS.... LOCKHEED

T-33 JET TRAINER

The Lockheed Aircraft Corporation, largest producer of jet aircraft in the world, has built almost as many jet airplanes as all other U.S. manufacturers combined. In fact, Lockheed has built jets at the rate of more than one a day—*every day for more than five years.*

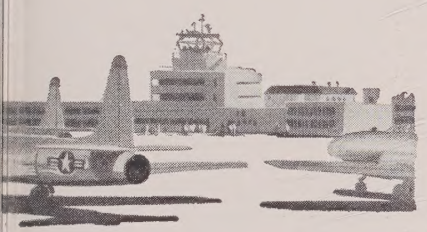
Important member of the Lockheed jet family is the two-place T-33 Jet Trainer (shown here), only jet trainer airplane built in America today (Navy designation: TO-2). This dual-control fighter-trainer now trains the pilots for the supersonic fighter planes of the Army, the Navy and the Marine Corps.

The experience obtained in the design, development and manufacture of jet fighter planes is invaluable in the Lockheed laboratories where the designs of the future are taking shape today.

LOCKHEED

Aircraft Corporation, Burbank, California

Look to Lockheed for Leadership



AIR YOUR VIEWS

Landing

Gentlemen:

The primary purpose of this letter is to compliment the staff on the fine job it is doing. The secondary purpose is to criticize in a friendly way the article "Pilots, Brush Up Those Landings," by Gloria Heath.

A minor point is a typographical error: the author speaks of emergency landings and says, "You want to *accelerate* in an area that offers uniform resistance." To land successfully it is, of course, necessary to *decelerate*.

Old pilots tell me it is much better to hit obstacles on the far side of the field at slower speed than it is to hit the near fence at flying speed. I feel this point was not emphasized enough as far as the student pilot is concerned.

A technique not mentioned but which is very much in mind when one flies a landplane over the hilly and rocky terrain of the north country is that of landing on any convenient lake. Stalling into the water along a shoreline seems to be the best advice if a lake or river is available. This, naturally, assumes a complete lack of smooth, boulder-free ground in which to make an emergency landing. If the water is lacking, I'd be inclined to try a tree landing, as in the article.

Accounts of the soaring pilots are of particular interest to me since I am a student glider pilot. So if anyone has an old, used "standing wave," à la Bishop Field, that they're not using, our Toronto Gliding Club would very much appreciate same.

J. D. GODDARD

Toronto, Ontario, Canada

Thank you very much, Mr. Goddard. The staff here as well as our readers like good informative letters like yours. You are right on the deceleration point. A typo did sneak in on us. And your remarks about hitting something on the far side of the field rather than the near side sound right, too. The editor's flight instructor used to harp on that subject. Fortunately, we have never had to try it out. Perhaps some reader-pilot may have an experience along that line, and will write us about it. We'll ask Bob Symons out at Bishop to earmark a lenticular for you.—ED.

More Landings and Take-Offs

Gentlemen:

"Pilots, Brush Up Those Landings," was an extremely interesting article. However, on an Ercoupe equipped with a 5:00 x 4 nosewheel, the take-off run usually will be shorter if the control wheel is held clear forward until minimum flying speed has been reached. Try it.

This does not apply to an Ercoupe equipped with a 5:00 x 5 nosewheel. It requires a slightly longer take-off run.

F. H. SCHAAD

Orland, Calif.

Gentlemen:

Having over 2,000 hours in my log book, I have witnessed many types of landings . . . most of them having room for improvement, and so I'd like to add my two-bits to Miss Heath's article.

Gloria maintains that the tricycle gear makes possible a faster touch-down because the lift can be immediately spilled by lowering the nosewheel. Well, you pilots who fly tail-wheel type ships can make exactly the same kind of landing on windy, rough days. The conventional type of landing gear will be with us for a long time because it offers certain advantages (lighter weight and lower cost) over the tricycle gear. So every pilot should know how to make a good wheel landing as well as a good three-pointer.

There are two common ways to make wheel landings:

1. The "DC-3 Landing". . . . Come in at a glide just a little faster than normal, flare out lower than usual, and touch down the main gear while the tail is still in the air in an attitude just a little lower than in cruising flight. As soon as the main wheels touch, come forward on the stick to spill your lift and hold the tail up until the landing roll is completed. This is a tricky landing and takes a bit of practice to perfect. My suggestion is to use it when the runway is short or when the field is rough.

2. The "Hot Landing". . . . Come in low and fast, possible just a hair under cruising speed. Approach the ground at a very acute angle (slice her thin). If the plane sinks toward the ground too fast, apply a little back pressure on the stick or add a little throttle . . . or both together. Touch the ground at an angle of zero lift—tail high and nose low; and apply forward pressure on the stick. Hold the tail high until it wants to sink of its own accord. Don't be afraid of nosing over, because you have full elevator control.

If there is a crosswind, make a one-wheel landing with the windward wing low. Caution: Don't land like this if your runway is short or rough or if there is not much wind. When landing on a gusty day, the advantages of a wheel landing are self evident. If you touch the ground at an angle of minus zero lift, no gust can lift you back into the air, and you have full elevator and aileron control until well along the landing roll.

I always teach my students to make wheel landings before I let them go on their solo cross-country hops. Then I don't have to worry so much when a strong wind comes up and they are out. Just for fun I once landed a *Super Cruiser* at 120 mph airspeed on a 6,000-foot concrete runway. You could hardly feel her touch the runway.

J. H. THOMAS

Wallingford, Iowa

Information noted, appreciated . . . and passed on. I'm a three-pointer m'self.—ED.

Plane Info

Gentlemen:

Do you have any information on the Curtiss AT-9?

J. PREAGER

Joplin, Mo.

The AT-9 was built in 1941 and '42. It was a four-place multi-engine advanced trainer powered by two 295-hp Lycoming engines. It had a top speed of 197 mph, a wingspan of 40 feet.—ED.

CAP News

Gentlemen:

We here in Detroit enjoy your magazine very much, but have one complaint. In the "CAP News," you rarely mention the Michigan Wing. Michigan has one of the most active Wings in the country and I should think you'd have something to write about.

SGT. J. KENT

Sqd. 634-5
Detroit, Mich.

How 'bout sending us news of the Michigan Wing so that we'll know what's going on? You send it to us, we'll use what we can.—ED.

Air Force Academy

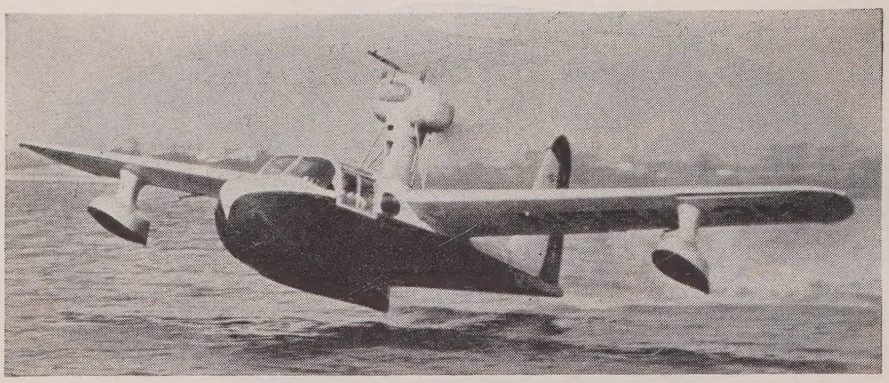
Gentlemen:

Can you tell me anything about the new Air Force Academy?

EDW. HILLMUTH

Manlius, N.Y.

Plans are not yet completed, so . . . no news.—ED.



TAKE-OFF photo of the Goodyear amphibian GA-2 shows its new planing-type hull which increases safety of plane while water-borne, and also steps up its flight performance

HANGAR FLYING

Continental Trophy Race

The National Air Races will not be without the midgets this year . . . or for the two years following. An announcement from the NAR committee states that Continental Motors of Muskegon, Michigan will sponsor the 190-cubic-inch event for 1950, '51 and '52. The event will be known as the Continental Trophy Race and it promises to be one of the outstanding annual lightplane events. Prize money covering this event and the consolation race will continue to be $25,000, and the race will be run over September 2, 3, 4.

Specifications and entry blanks for the Cleveland Continental Trophy Race are available from either the NAA in Washington, D.C., or from the National Air Race office in Cleveland.

Marketing the Helioplane

The Helio Aircraft Corporation has announced a unique marketing procedure for its two-place *Helioplane,* expected to be available sometime during the late summer. This marketing plan, never before attempted in the aircraft field, guarantees plane service and maintenance to *Helioplane* owners in much the same way as TV sellers provide service on television sets.

Service organizations will be set up in specified areas, and these organizations will relieve the *Helioplane* owner of all maintenance responsibilities, except keeping his *Helioplane* supplied with gas and oil. His plane will be inspected regularly, improvements and modifications made as they are ordered or developed by the plane manufacturer, and all preventive-maintenance steps taken. *Helioplane* sales at first will be confined to a few selected areas, with new ones being designated as *Helioplane* service centers grow in number.

Nat'l X-C Flying Assn

A report from Boston, Mass. announces the formation of a new non-profit, non-political organization devoted to the promotion of cross-country flying in civil aircraft. Called National Cross Country Flying Association, the organization plans to foster transcontinental and local group flights, and to assist local chapters in organizing group X-C's, breakfast flights, etc. Membership is $3 per year, and it includes insignia and a monthly association bulletin. For further information, write NCCFA, P.O. Box 256, Boston 1, Mass.

Radio for Small Airports

At a recent meeting of the Board of Directors of the Nat'l Association of State Aviation Officials (NASAO), a plan was presented to the FCC which would provide a standard low frequency to be used by airports for ground-to-air communications. If the plan can be set up, it will mean that airports, regardless of size, will be able to set up a small transmitter and receiver. Thus transient pilots as well as trainees will be able to communicate directly with the airport regarding field conditions, weather, etc. The FCC is presently trying to work out the details of this plan.

National Park Airports

Legislation recently approved by President Truman makes possible the development of airports near the entrances to national parks and monuments, it was announced recently. Under Public Law 462, the Secretary of the Interior is authorized to "acquire, construct, operate and maintain public airports" outside but close to the entrances of these national park areas. This is good news to the thousands of pilots and plane owners who have expressed the desire to visit the national parks by plane, but who thus far have been unable to because of the distances between airports and park areas.

New Sailplane

A new all-metal sailplane, designed to return to the U.S. the distance records held by the Russians since prewar days, has been announced by Schweizer Aircraft Corp., of Elmira, N. Y. The first high-performance sailplane to be CAA-approved and production built, the I-23 has soared to 30,500 feet altitude, and preliminary investigations are under way for a pressurized-cabin version of this model. New records are expected to be made with the Schweizer I-23 when pilot-owners converge on Grand Prairie, Texas August 1 to 13 for the 17th National Soaring Contest.

Murdale Airport

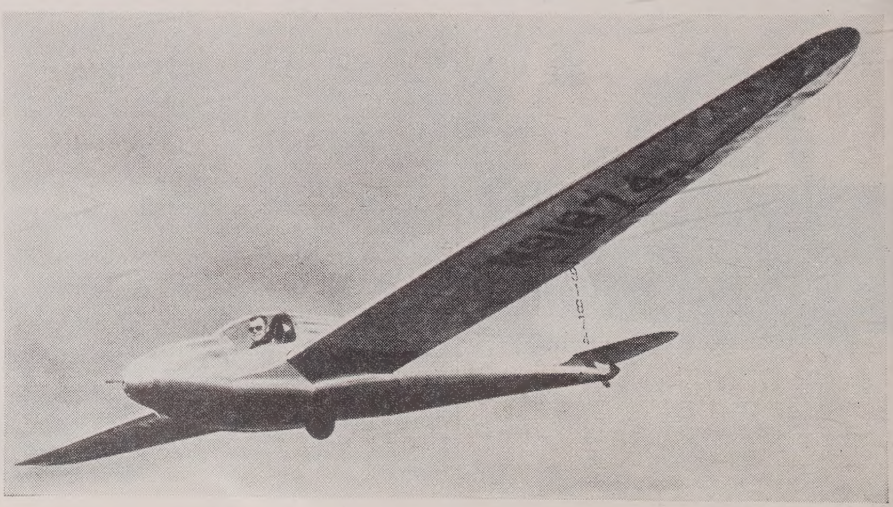
Midwestern Aero Service, Inc. has announced the opening of Murdale (Ill.) Airport, located between Carbondale and Murphysboro, Illinois. The field consists of 231 acres, one 4,000-foot runway of which 2700 feet is paved, one 3300-foot runway, one 2700-foot runway, and a concrete ramp. Buildings include a service hangar and a 10-unit T-hangar. An administration building, beacons and runway lights are under development. Complete fixed-base operations are being conducted and service includes 80 and 91 octane gasoline. Carbondale Airport has been closed, so Murdale will service both Carbondale and Murphysboro, Ill. Note this change on your sectional.

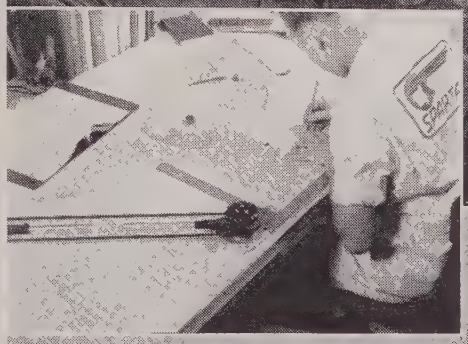
Airplane Use

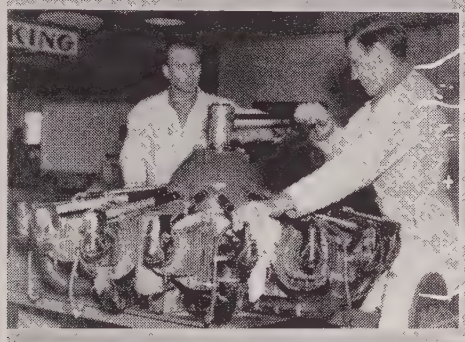
The CAA reports private flying in 1948 decreased 7 per cent from the 16,334,000 hours recorded in 1947. Instructional usage of private aircraft averaged 282 hours a year while pleasure flying averaged only 58 hours per plane. Business flying registered the largest gain of any type of flying for the second successive year. Volume of personal flying showed relatively little change. Average use per aircraft dropped to 169 hours from 1947's 189 hours. Aircraft owners located in CAA Regions 6 and 7, the Southwest and Northwest states, used their planes most, while there were more aircraft in use in Region 3 than in any other section.

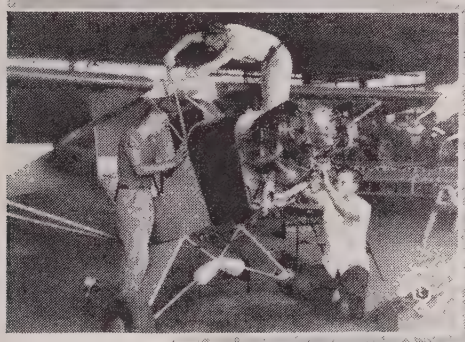
Details are in the CAA's report "Aircraft Use in 1948," from the Gov't Printing Office, Washington, D.C., for 20 cents.

SCHWEIZER I-23 is a new all-metal sailplane designed for high performance. Preliminary investigations are underway for a pressurized-cabin version of this new model









WHAT are they DOING?

The young men in these pictures are on the jobs for which they trained; good-paying jobs that require skilled hands. Only a few short years ago they only hoped to hold such positions. Study and training was the solution. You can follow in their footsteps. Thousands of new employees are needed in aviation — men with training to build, fly and service the speedier, more powerful and longer-range aircraft. The only limit to your progress in aviation is lack of training and skill.

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TEST PILOT who first flew the Douglas D-558 *Skyrocket* was Gene May, probably best known civilian test pilot

COCKPIT of the Douglas *Skyrocket* is well padded to protect pilot from "bumps" emphasized by high-speed flight

Mission: D-558

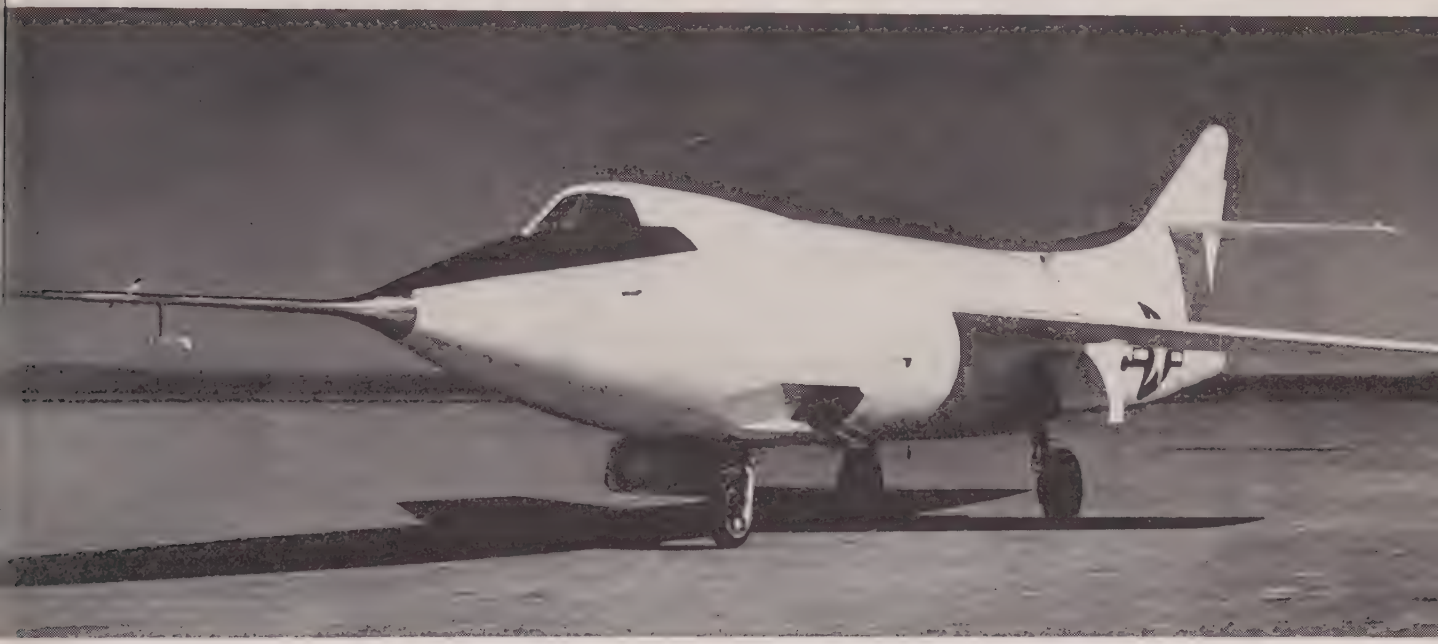
TRIO who flew *Skystreak*, predecessor to *Skyrocket*, was *(left to right)* Maj. Carl, Gene May, Cmdr. T. Caldwell

By GILBERT C. CLOSE

IT WAS H-hour in the desert, June 24, 1949. The air above the great Mojave was crystal-clear, and the 12-mile bed of ancient Muroc Dry Lake lay cement-hard and flat under a brilliant sun. Mountains on the horizon painted a blue backdrop for the drama that was about to occur.

A test pilot walked toward the waiting airplane. He was dressed in street clothes, with a crimson crash helmet on his head and a parachute dangling from his hips. He mounted a step ladder, crowded into the padded cockpit, then lowered the canopy that sealed him in an air- (*Continued on page 47*)

RESEARCH D-558 was delivered to Muroc for press demonstration by a trailer truck especially designed for hauling the plane



JET ENGINE in the D-558 produces 3,000 pounds thrust; four rockets provide another 6,000 pounds for 80 seconds

SKYROCKET came skimming across the desert at altitude of 50 feet at 800-mph speed. Gene May was at controls

LET'S QUIT GRIPING!

BELLANCA, CESSNA are two examples of good engineering, low-cost operation, practical transportation for today

RANCHER *(above, right)* bought a used Bellanca from E. A. Poe *(left)* for $3,900. Plane had just 182 hours on it

By MIKE JENSE

Central Utah Aviation

PEOPLE who think everything under the sun is wrong with aviation always start out bellyaching about the airplanes. They won't do this, and they won't do that!

As far as I'm concerned we've got the best airplanes available *right now* that we have any reason to expect. If there is anything wrong, it is with ourselves in our failure to properly sell aviation, and to properly adapt today's planes to their correct use.

The majority of the critics simply don't know what they are talking about and valid criticism is almost nonexistent.

We have, today, just what we have wished for during the last three decades—reasonable fulfillment of our desires and our main requirements. So what, it doesn't whistle?

Just to name a few items that we lacked only 10 years ago, today we have speed, safety, comfort, range, utility, economy, ease of handling, excellent electrical systems with navigation and landing lights, good two-way radios at low cost, reliable weather information, standard repair and maintenance costs, frequency of airports and basic services

NEW NAVION recently was purchased by businessman whose introduction to aviation came via used plane. The used plane was in excellent condition, served his needs perfectly, sold the businessman on remaining a plane owner

TODAY'S AIRCRAFT feature a lot we didn't have 10 years ago: all-metal construction at low cost, stall-resistant airfoils, dependable engines and instruments. That combination few years ago would have cost twice as much as it does now

and a steadily increasing supply of courtesy, merchandising and good will. That is everything that we thought we lacked in 1930 when I first got started flying. And, above all, today's good airplanes are selling for a fraction of what mediocre ones cost before the war.

I suspect that a prime source of complaint is that people have not yet learned to properly think of airplanes as a superior form of transportation with only minor limitations. The airplane of 1950 excels all other means of transportation in many respects and competes favorably with the rest. But people have some incalculable idea that airplanes are an end in themselves and should (*Continued on page 42*)

AUTHOR Mike Jense of Central Utah Aviation proves flying offers best dollar value on transport market today

SATISFIED CUSTOMER is one who gets his money's worth and he will be back in a year or so ready for a new plane

Pilot's Report... *Fulton Airphibian*

By L. M. Horton

AIRPHIB' ground unit "taxied" author and Fulton to town

Private aircraft industry analysts have long recognized the factors responsible, in part, for the low-volume sales of private planes. Prominent among these factors is lack of utility which, in turn, means lack of economy.

Engineering efforts, bent toward increased and combined utility, have produced bigger cargo units, wheel-ski gear, crosswind gear, tractor-tread gear and, agriculturally, duster-sprayer combines.

But—and I think anyone will agree—the present private plane's utility still ends where its tie-down begins—at the airport. Why? Simply because the plane can't be driven into town where business is carried on, nor can it be used when weather limitations are imposed.

For the past four years, Robert Edison Fulton, Jr. (names to live up to!) has worked with an intelligent, flexible idea. This idea came as a direct result of his work during the war. Fulton's work kept him traveling around the country in his own plane. Everywhere he went he encountered that old problem so familiar to all who fly, namely, lack of ground transportation.

Inasmuch as an airplane possesses the same basic component parts as an automobile: an engine, wheels, controls and a place to sit, why then, Fulton asked himself, could it not be driven down the road? The wings and tail too big? O.K., then disconnect them. And that is exactly what Bob Fulton decided to do. With yesterday's engineering research and development principles as a basis, he has constructed "today's" vehicle that combines the utility, speed, and convenience of the airplane, with the undisputable utility and (*Continued on page 16*)

CONVERSION to flight calls for lowering the ground unit's plastic top

FLIGHT UNIT is "cranked" to desired height. Then the ground unit is backed in under flight unit. Front of flight unit fits over road unit like roof

FULTON AIRPHIBIAN gets away from the ground nicely. Normal climb is 600 fpm, 2250 rpm at speed of about 60 mph

SKY HOOKS on the wings engage chassis of the ground unit both front and rear. Units are locked together by series of seven connections. Controls are then engaged

PROP is then removed from its rack, attached to engine via eight studs

GROUND UNIT of the *Airphibian* is good solid "car" to drive, rugged in construction, solid on the road

PATROLMAN Hickerson, intrigued by *Airphibian*, decided not to give author and Fulton ticket for illegal parking

COCKPIT of the *Airphibian* features complete panel, and offers real sitting-flying-driving comfort on long X-C's

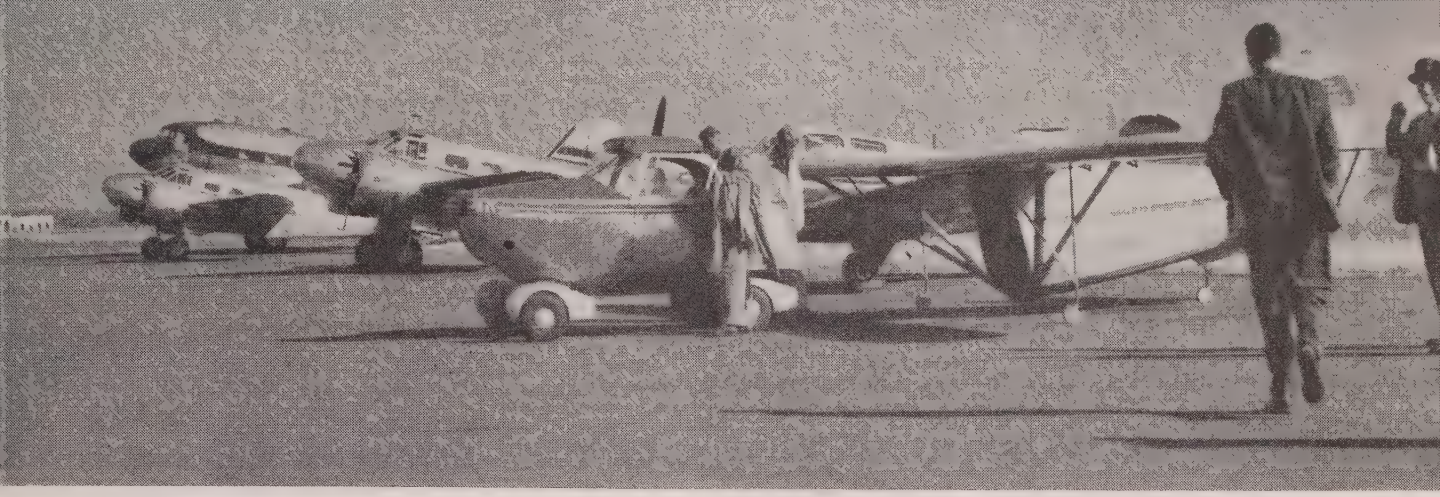
ground transportability of the automobile. He calls it *Airphibian*, and it is certainly in tune with what the traffic-jammed public is now thinking. With several hundred thousand miles of both road and flight testing in its log and CAA certification successfully accomplished, the first commercial "airphibious" vehicle is on its way to market.

We've all heard about the *Airphibian* and have seen pictures of it during the last few years, but incorporating new engineering know-how into one completely workable whole is a long-term proposition. Not only did Bob Fulton have to *prove* his idea workable, he had to re-certificate every item changed from the established (and already certificated) pattern of operation to meet his requirements. Where normally the engine, prop, wheels and even landing gear are purchased already CAA certificated, all these items and more had to be modified for use in the *Airphibian* and had to be re-certificated. Even a whole new terminology had to be developed in keeping with the new concept of combined air and road travel . . . or *airphibious* operation.

The man who owns an *Airphibian* is going to be a hard man to keep up with. Your flight-correspondent literally chased Bob Fulton all over three states for this SKYWAYS report. He had to go to Washington, D.C. on business. As a test trip it was an ideal opportunity to investigate, first-hand, the practicality of such a vehicle. I immediately decided to keep careful check of air mileage, road mileage, time, trips, fuel consumption, etc. If airphibious transportation is here to stay, a trip would quickly tell.

On a Tuesday afternoon shortly after 2:30, Bob Fulton pulled up in front of my Manhattan apartment. He'd flown down from the factory in Danbury, Connecticut, that morning, landed at Teterboro Airport, New Jersey, driven into New York to attend to some matters in town, and then stopped

ROAD UNIT of the *Airphib* was driven from New York to airport at Teterboro, New Jersey, via George Washington Bridge



AUTHOR HORTON and Bob Fulton estimated taxi fares they saved on *Airphibian* trip from New York to Washington, D.C. and return amounted to about $52.20. Fuel consumption for both air and road operations was about 15.8 miles per gallon

by for me. I threw my suitcase and camera equipment in beside his on the baggage deck and we drove to Teterboro Airport via the George Washington Bridge. We not only kept up with traffic on the 13-mile ride to the airport but we passed most of it when we had the chance!

The first thing that impressed me when I got into the *Airphibian* and we drove away was its solidity. In retrospect I believe I had expected it to be flimsy, to dance around the road and to be delicate to a point where it would require very special handling. After traveling almost 800 miles in three days in it, I find it hard to believe that I ever thought of it as anything but a rugged (*Continued on page 36*)

CRUISING SPEED of the airplane is around 112 mph at 2350 rpm. Trip up from Washington took 2 hours 14 minutes

WING WHEELS and tail wheel support the flight unit *(above)* while parked. The tail wheel is retracted for flight

INSTALLATION of *Mamba* turbo-props in DC-3 caused minimum of modification. Note bifurcated exhaust above wing

Turbo-Prop DC-3

By WILLIAM GREEN

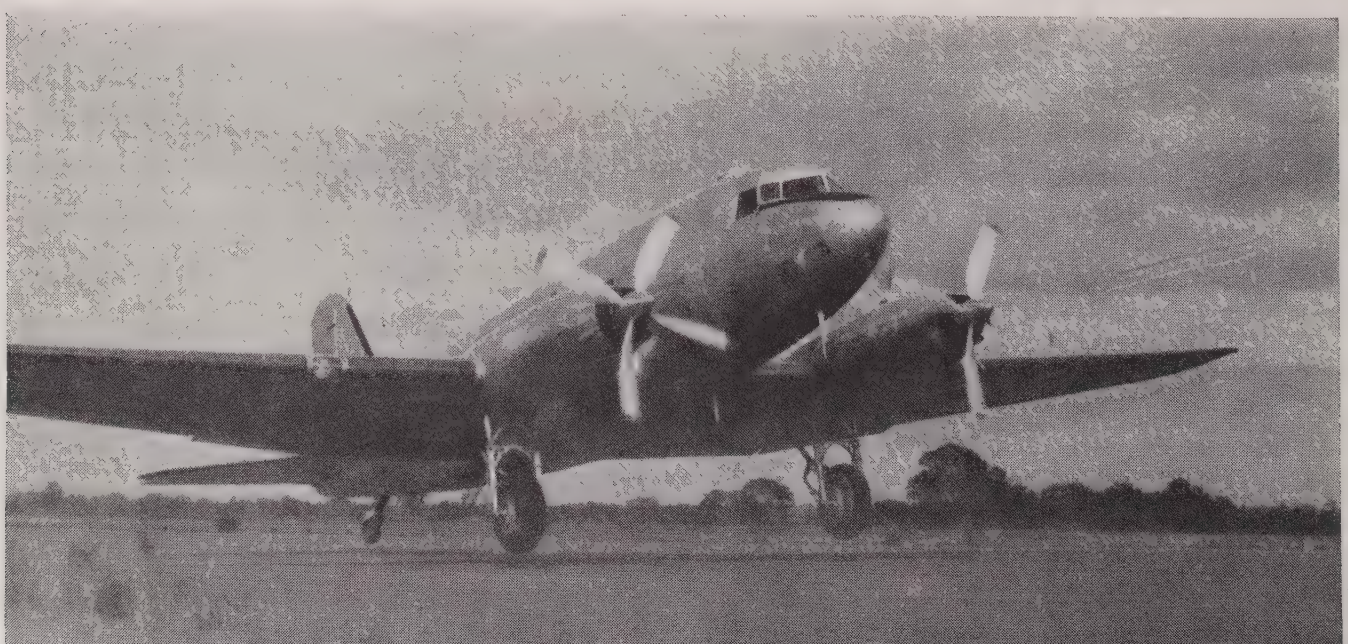
Has Britain found the answer to the pertinent question of providing a cheap, economical 'hopped up' conversion of the ubiquitous DC-3 to meet ICAO requirements and the pockets of the smaller operator?

When the ICAO take-off regulations come into force, the world's most widely used transport airplane, the Douglas DC-3, will cease to be an economic unit of transportation. A pertinent question on the lips of many of the world's smaller airline operators is "How can we afford to replace our DC-3's?" It looks now as though the answer may be found in Great Britain.

The DC-3 was already a veteran on the air routes a decade ago. Old age seemed not too far distant and many of Douglas' competitors were busy on models intended to make the ubiquitous DC-3 look like a contemporary of the Wright biplane. But one large-sized war stepped in the way of the realization of these anticipations, and when the Air Force began handing out large orders for transports, the DC-3 was the only sizable airplane with a sufficient backlog of commercial and military experience to ensure that all the 'bugs' had been worked out. Thus, by the end of the war a grand total of 10,926 airplanes of the DC-3 type had left the assembly lines.

What was simpler and cheaper than the conversion of hundreds of these miltary transports for commercial duties for which they were originally designed anyway? Such conversions were carried out in countries as far apart as Britain, Turkey, Holland and Italy, and the obvious result has been that the majority of the world's short- and medium-haul routes are now operated by the DC-3. Imagine the consternation among the DC-3 operators when ICAO ruled that to meet its new take-off requirements,

TAKE-OFF of the *Mamba-Dakota* is like any other DC-3 except that it is appreciably shorter, meets ICAO requirements.



STANDARD DC-3 is powered by Pratt & Whitney *Twin Wasps;* is not economical to operate under the ICAO conditions

the maximum weight of the standard Pratt & Whitney-powered DC-3 would have to be reduced by some 4,400 pounds (from 28,000 pounds to 23,600 pounds), making it a very uneconomical airplane to operate. Douglas' answer was the Super DC-3, the plan being to take old DC-3's from operators and modify them up to the new Super DC-3 standards. But these modifications were to cost something between 140,000 and 200,000 dollars, a lot of money for a small operator with a limited capital.

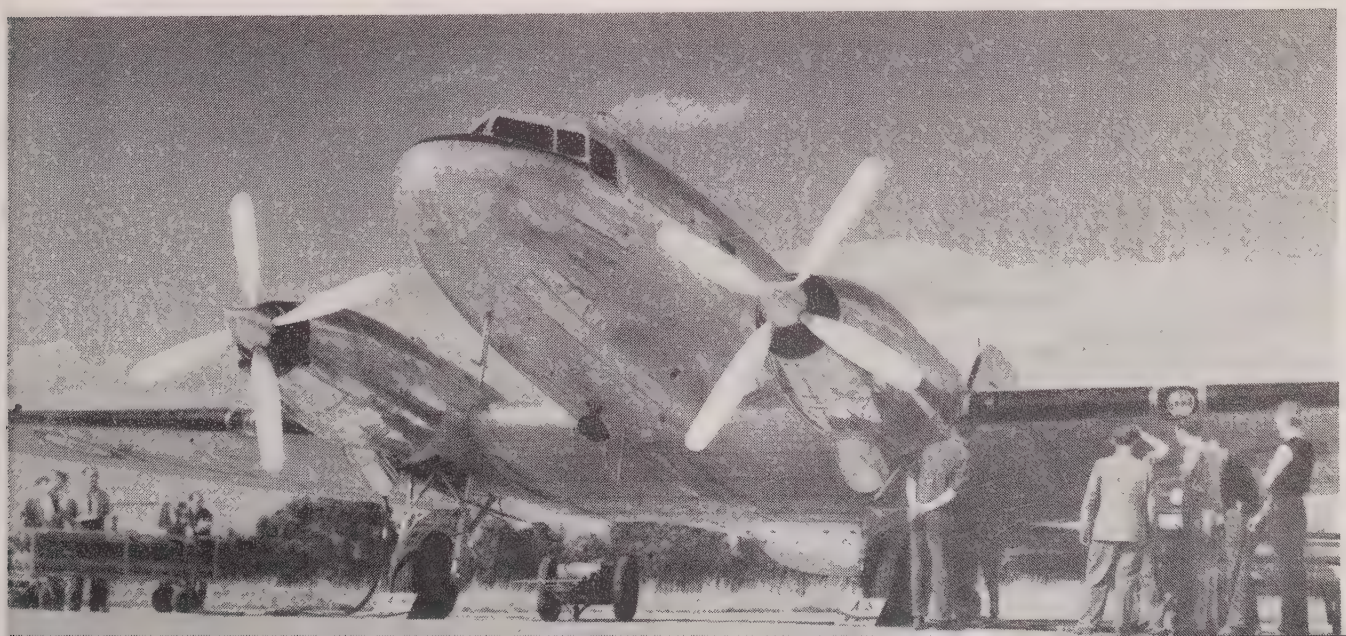
What other solution is there, apart from buying completely new and considerably more expensive aircraft? Surprisingly enough, the answer has come from Britain and is the *Mamba-Dakota.* The *Mamba-Dakota* (*Dakota* being the name given to the C-47 by the RAF and one by which the DC-3 is still affectionately known in England) is a normal C-47 transport with its standard piston engines replaced by two 1,475 equivalent shaft horsepower Armstrong Siddeley *Mamba* 3 turbo-props. The conversion has been effected with the minimum amount of modification to the airplane, thus costing the operator but a fraction of what it would cost him to have his DC-3's converted to Super DC-3's.

MAMBA-POWERED DC-3 meets all the ICAO take-off requirements; could continue to be used on medium-haul routes

The manufacturers of the turbo-prop who, incidentally, also undertook the first conversion of the DC-3, believe the *Mamba-Dakota* will appeal to airline operators for three main reasons: (1) The installation of engines of higher horsepower enables the DC-3 to meet the full ICAO take-off requirements at a weight of only about 1,300 pounds less than the present maximum of 28,000 pounds, without any modification to the airplane's structure other than that directly involved by the installation of the *Mamba* turbo-props. With the existing Pratt and Whitney engines the weight would have to be reduced by about 4,400 pounds to meet the new ICAO requirements and, needless to say, in such a lightly loaded condition, the DC-3 would not pay its way. Therefore, the installation of the *Mamba* will prolong the life of the DC-3 beyond the ICAO dateline.

(2) The conversion costs far less than the purchase of any new turboprop-engined airplane or the conversion of the existing DC-3 to Super DC-3 standards. In addition (*Continued on page* 38)

COST of converting DC-3 from *Twin Wasp* to turbo-prop is less than converting standard DC-3 to Super DC-3 standards



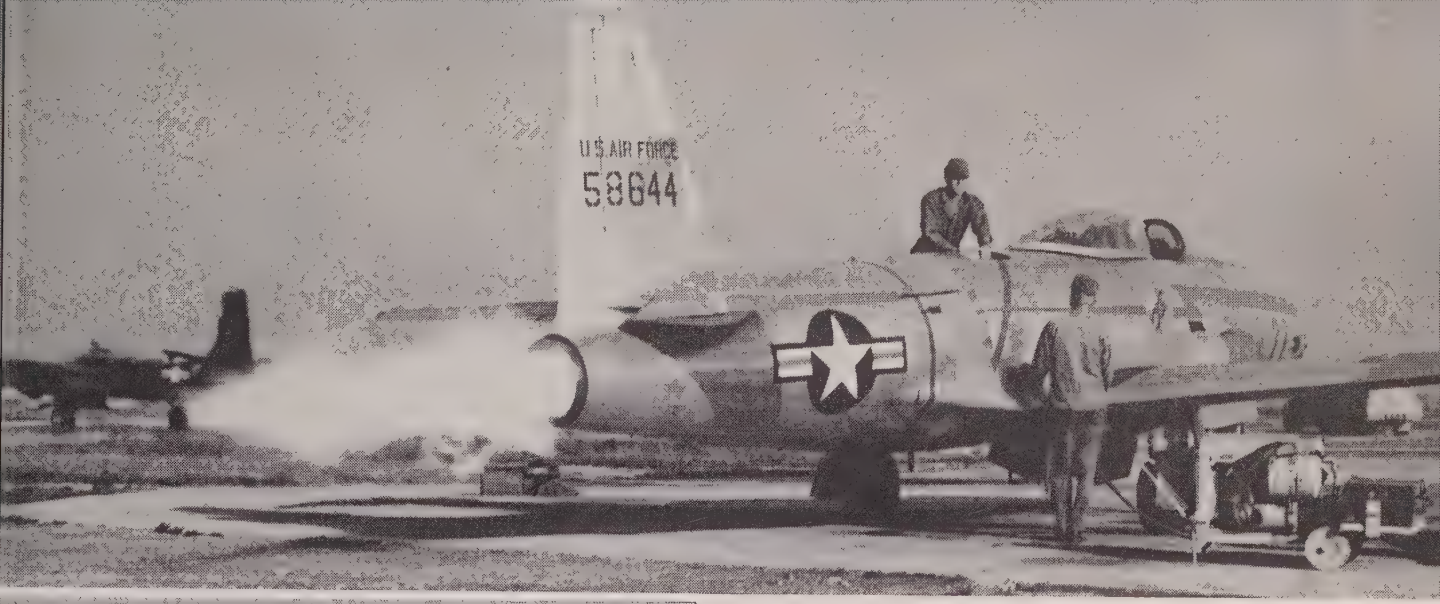
FIGHTING TWO TWO, as the 22nd Fighter-Bomber Squadron is called, is based at Furstenfeldbruck AFB, Germany, and is part of the 36th Fighter-Bomber Wing. C.O. of the squadron is Major Herb Jordan *(fourth from left, front row)*. Simulated warfare is a daily "Two-Two" duty

Scramble!

36th Fighter-Bomber Wing maintains day and night patrols over U.S. Zone

By CAPT. CRAIG S. POWELL

D FLIGHT gets ready for a mission. After donning flying gear, men meet for briefing before mission. When "Scramble" alert is sounded, pilots of the 22nd Fighter-Bomber Squadron race for their jets, soon are in full formation heading toward target at more than 500 mph



FIRED UP, with assistance from the outfit's ground crewmen, the Squadron's F-80's roll out for take-off. There is no warming up for jet aircraft. Pilots name their planes. F-80 *(left)* is called "Ramblin' Ruthie"

SCRAMBLE! Pilots rush for their aircraft. Crew Chiefs strap their pilots in. Flames start. Twenty-five red-striped F-80's taxi at break-neck speed towards the take-off strip. As they roll down the runway at 100 per cent take-off power a voice blasts out over the squadron radio, "If you can't cut it, Raus!" (*i.e.*, "If you can't make the grade, get out!") . . . and it's "Fighter Up" with Major Herb Jordan and the "Bumble Bees" of the 22nd Fighter-Bomber Squadron. Minutes later the 22 is at 35 angels (*i.e.* 3,500 feet altitude), streaking toward its target at 500 plus.

"Vector 230 degrees, Aggressor tanks crossing clearing in Mannheim area," comes clearly over the VHF as radar control directs the Air Force striking arms to its objective.

"Target sighted—go get 'em, Flatfeet," and the F-80 jets scream for a low-level attack on enemy units holding up the advance of American Forces.

This is merely simulated warfare, yet the 36th Fighter-Bomber Wing and the other supporting units of Brig. Gen. Thomas C. Darcy's 2nd Air Division stand as America's "First Line of Defense" on the European Continent. A line of defense that though few in (*Continued on page 40*)

USAF JETS maintain constant vigil over U.S. Occupied Zone of Germany. The outfit flies day and night patrols

THE ACROJETS

AERIAL BALLET performed by this F-80 aerobatic team has thrilled thousands of on-lookers at air shows throughout U.S.

By AL LEACH

THE "attention grabber" was on, and his voice boomed out of the loud-speakers above the grandstand.

Four sleek, silvery F-80 *Shooting Stars* were sliding in at more that 550 mph Indicated from behind the thousands in the crowd at Scott Air Force Base near Belleville, Illinois, in the St. Louis metropolitan area.

The Mach-line speed run to open the show of precision aerobatics in jets always has been the favorite stunt of the Acrojets, a four-man team from Williams AFB near Phoenix, Arizona.

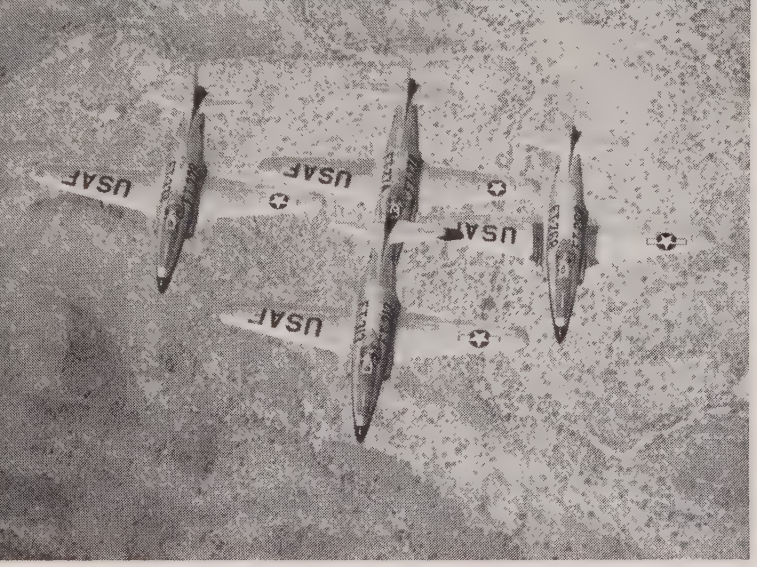
As usual, everything was right for the Acrojet pilots. Major Howard W. "Swede" Jensen was leading the diamond formation. Captain Robert C. "Tommy" Tomlinson was checking out as left-wing man, and was in perfect position. His inside wing was nearly under Jensen's fuselage, and just four feet away from Major Jones E. Bolt's wing on the right side. Major Walter K. Selenger was riding in the slot position, just a foot and a half under Swede Jensen's tail pipe.

Everything was right, that is, until the last five seconds before the blast of the jet engines was to take the audience's complete attention. Then it happened—as unexpected as it was unnecessary:

Somebody—Dilbert was his first name for sure—came pooping low across the edge of Scott Field in a lightplane, apparently hoping to see "them fast jet jobs."

Naturally, the area around Scott had been on NOTAMS as dangerous, and civil airmen were warned to stay away. The Air Force never fails

ACROJETS are *(left to right)* Maj. Jensen, Maj. Bolt, Maj. Selenger, Capt. R. C. Tomlinson, and Lt. Mike Smolen



DIAMOND FORMATION is maneuver Acrojets use for opening sweep over show area. Note tail shadow on left wing F-80

to take this precaution, if for nothing more than to protect themselves. A 500-mph *Shooting Star* and a 100-mph Ercoupe don't mix well, especially on converging courses.

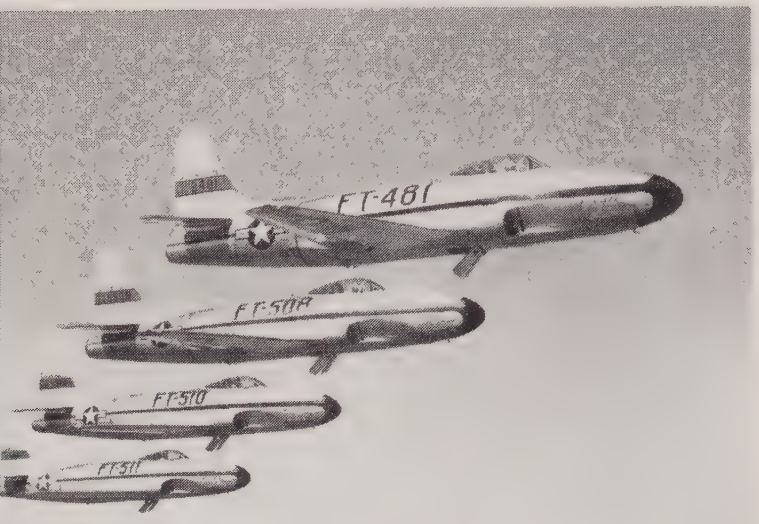
Tommy Tomlinson saw Dilbert.

Realizing the rate of closure, he instinctively pulled up—into Major Jensen's airplane. There was a crunch as Tommy's right wing neatly knocked a two-foot hole in Jensen's left horizontal stabilizer.

Seeing his wing tip was not damaged, Tommy got on the radio fast, "You're holed, Swede, you're holed!"

"Pulling up and out," answered Jensen, meaning he was quitting the formation while he still had a piece of tail section left. By pulling up he at least would have more altitude for a bail-out if the loss of tail surface spread.

FINGER FORMATION offers another example of precision jet flying. Note the F-80's have their dive brakes down



As Jensen called Scott Tower for an emergency landing, Lefty Selenger ran up into the lead position. Then, even as the three-ship formation roared across the crowd, Lieutenant Michael Smolen, regular left-wing man who was airborne and cruising nearby for just such an emergency, scooted into Selenger's slot and the show went on.

They were formed up again by the end of the speed run, and pulling up to 5,000 feet to begin a series of Immelmans, Cuban 8's, Clover Leaf, and Split S maneuvers, ending in a spectacular Bombshell which has to be seen to be appreciated.

That is just one incident in the flying of the Acrojets who have been demonstrating their abilities before millions during the last two years.

The boys often "come close" but never has anyone been injured. The only "casualty" chalked up was the transfer of the original right-wing man, Captain Benjamin F. Yeargin, Jr., to Las Vegas (Nev.) Air Force Base.

So popular have the Acrojets become that now their presence at an air show requires direct approval of the USAF Headquarters in Washington. Main reason for this "approval" is that the Acrojet pilots' duties are to teach youngsters to fly at Williams AFB, and not to show off their own talents. Thus, when the Acrojets' popularity led to demands for their appearance two and three times a week anywhere from Elmira, N. Y., to Miami Air Maneuvers, to Klamath Falls, Wash., and cadet graduations at their own base, some kind of restriction on their time had to be imposed. The Pentagon Brass in Washington was the answer.

But the performance of these masters at jet maneuvers is so perfect that six months after the formal request rule, the Acrojets still leap across country for an air show at least once a week.

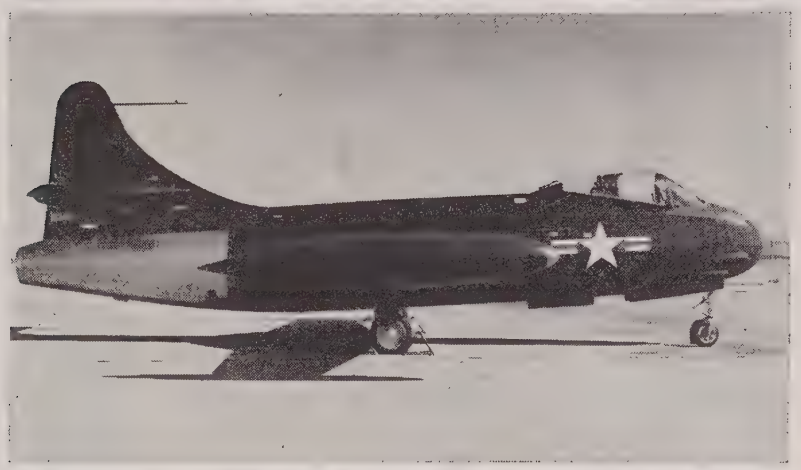
The routine of their performance has varied only slightly since its inception. They take off in a finger formation, form a diamond on gear-up at the end of the runway with Selenger sliding over into the slot.

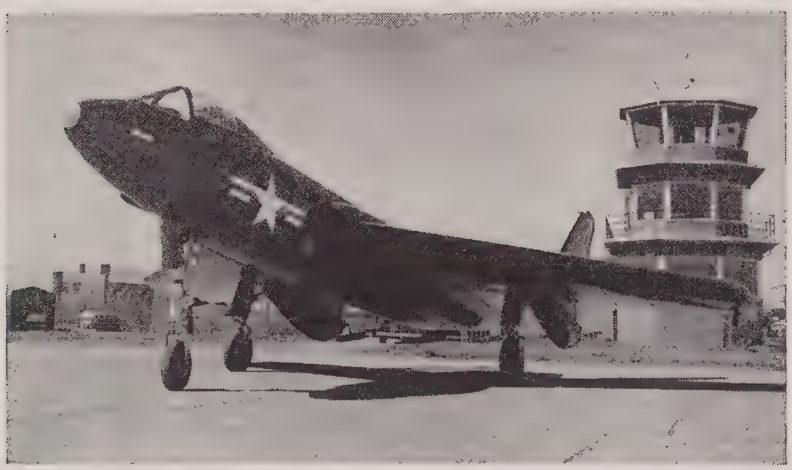
A speed run 50 feet above the crowd starts their 15-minute show. In that short time a pile of flying ability is compacted into the fastest, closest, and most spectacular performance ever seen in the air. Experts agree to that.

With the Immelman, the boys swing into a series of Cuban 8's, considered the most difficult formation maneuver. It consists of a Half-Loop for the close-flying planes, a Half-Roll on top, down, and then a pull-up into the same maneuver again. It looks like a figure 8 on its side.

The Split S is incorpo- (*Continued on page 52*)

U.S. AIR NAVY





CHANCE-VOUGHT

CORSAIR F4U-5N In service and still in production, the F4U-5N *Corsair* night fighter is powered by 1900-hp Pratt & Whitney engine. It has a top speed "over 450 mph," and a service ceiling of "more than 40,000 feet." Note the radar.

PIRATE F6U-1 The Chance-Vought jet fighter in production for the Air Navy is this F6U-1. Powered by a Westinghouse J-34 with afterburner, the *Pirate* is in the "550-mph class," features a climb of 7,800 fpm, over 38,000-foot ceiling.

CUTLASS F7U-1 A 600-mph fighter, the *Cutlass* is at this time an experimental airplane. Powered by Westinghouse J-34 jet engine, it is classified as a "600-mph ship." The plane has a gross weight of 20,000 pounds, has 39-foot wing span.

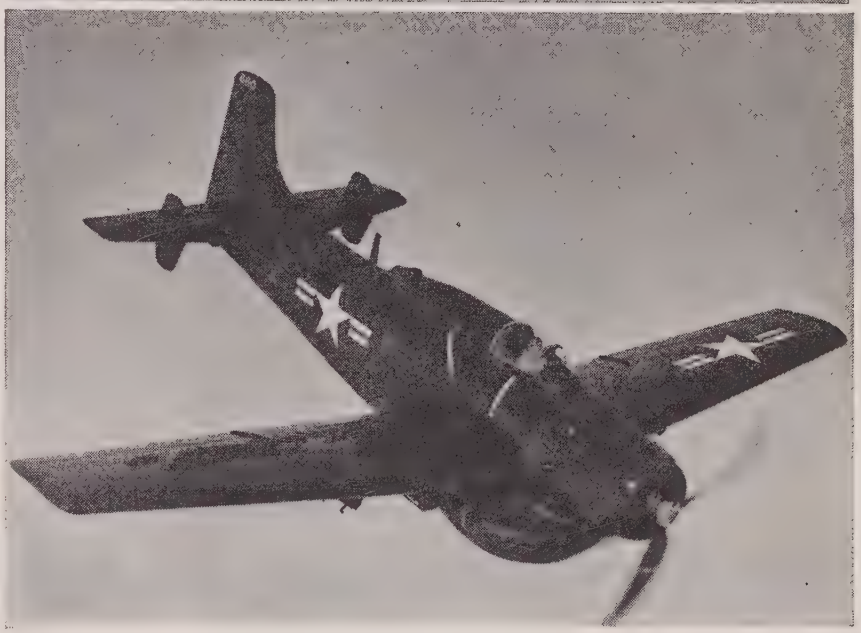
CONVAIR

XP5Y-1 The Air Navy's first turbo-prop flying boat, the XP5Y-1 was designed for long-range search and rescue missions and anti-sub patrol. This turbo-prop flying boat has a gross weight of some 60 tons and a top speed of more than 350 mph. It gets off water in less than 30 seconds, is powered by four Allison XT-40's.

DOUGLAS

SKYKNIGHT F3D A night fighter designed and built by Douglas, the F3D is powered by two Westinghouse J-34 jet engines which give it a top speed of "more than 550 mph." Designed as a long-range carrier-borne fighter, the *Skyknight* is equipped with plenty of radar, carries a crew of two, is heavily armed.

SKYRAIDER AD-3W The third in the series of AD fighters for the Air Navy, the *Skyraider* is an attack plane equipped with a great quantity of radar and electronic gear. It is a single-seater powered by a 2700-hp (maximum) Wright engine which gives it a top speed of over 350 mph and a service ceiling of more than 33,500 feet. The *Skyraider* series began with the AD-1. Douglas Aircraft is now building the AD-4. Only differences between the '4 and '3 are internal.

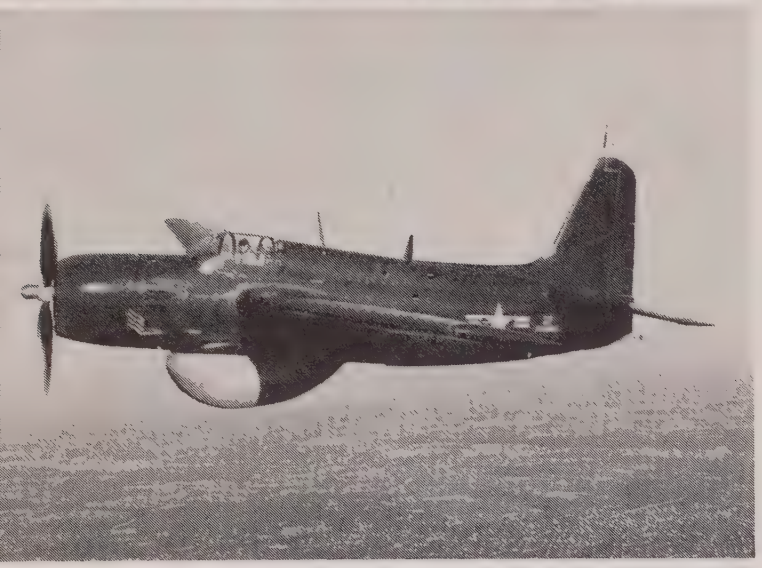


FAIRCHILD

PACKET R4Q Navy transport, the R4Q *Packet* is identical to the Air Forces' C-119. It is powered by two Pratt & Whitney 24-cylinder engines rated at 2,650 hp to 6,000 feet. It has a top speed of 265 mph and a service ceiling of 21,200 feet. It has a cargo capacity of 2700 cubic feet. Several R4Q's have been assigned to the Marine Corps and are being used by Marine Transport Squadron VMR-252 to provide logistic support to their USMC air and ground units.

GRUMMAN

ALBATROSS UF-1 A utility airplane in production for the Air Navy, the *Albatross* is a twin-engine amphib to be used for rescue as well as personnel transport. Its engines are 1,425-hp Wrights. The *Albatross* has a wing span of 80 feet, is 60 feet 8 inches long and 24 feet 4 inches in height. The amphib carries a crew of six, has litter space for 12, or seats 18 (maximum). Its estimated top speed is about 270 mph. AF version of the UF-1 is SA-16A.



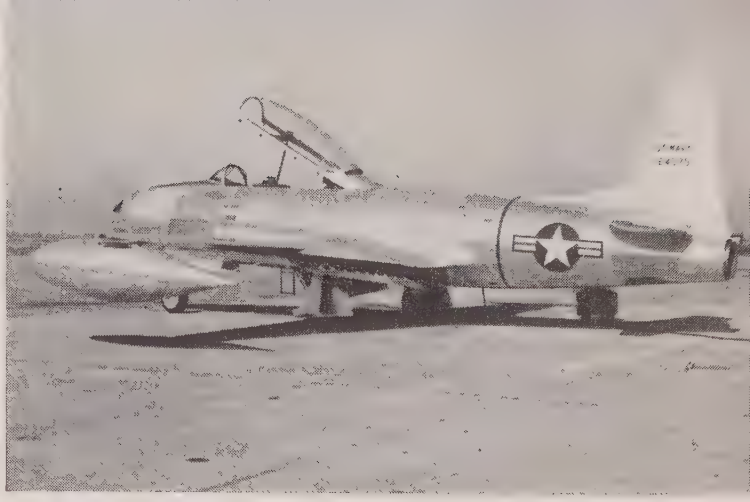
GUARDIAN AF-2W An anti-submarine fighter, the Grumman AF-2W is believed to be one of the largest single-engine aircraft built. Powered by a Pratt & Whitney R-2800 engine, the *Guardian* has a gross weight of somewhere near 22,000 pounds. All facts and figures regarding this airplane remain classified, hence nothing is available regarding performance and special equipment. The radome fastened to the belly of the ship contains the *Guardian's* night and all-weather "eyes." Another version of the AF is the AF-2S. The AF-2S looks like the AF-2W except for the radome. A new Grumman Navy fighter coming up is the XF-10F, a radical new Navy type.

PANTHER F9F One of the Air Navy's hottest jet fighters is the F9F powered by a J-42 jet engine built by Pratt & Whitney. This engine has a static thrust rating of 5,000 pounds. Estimated speed of the *Panther* is "more than 600 mph." It has a gross weight of about 17,000 pounds. Wing-tip tanks increase the range of the *Panther*. Facts and figures regarding the *Panther's* performance are classified. The single-seater has a wing span of 38 feet, is 40 feet long. Its wings fold up to facilitate storage aboard carriers. Sidelight to *Panther* picture is the fact that AF as well as Navy pilots claim the F9F is the fighter to knock-out bombers like the B-36.

LOCKHEED

NEPTUNE P2V-4 Equipped with the latest electronic and ordnance equipment, the P2V-4 was designed to meet the threat of snorkel-type enemy subs. Powered by two Wright R-3350-30 W "compound" engines, the *Neptune* has a speed "over 300 mph," and a ceiling of more than 25,000 feet. It carries a crew of seven. Although not specifically designed for aircraft-carrier operations, the P2V's have taken off from carriers on several "test" occasions.

TO-2 This is the trainer version of the jet *Shooting Star*. A two-placer, the TO-2 is powered by an Allison J-33 jet engine which gives it a maximum speed at sea level of 580 mph. It has a rate of climb of 7,625 fpm, and its service ceiling, fully loaded, is 40,400 feet. It has a range of 1,345 miles and a fuel capacity with tip tanks of 683 U.S. gallons. The TO-2 has a wing span of 38 feet 10 inches, is 37 feet 8 inches long and is 11 feet 8 inches in height. Stalling speed of this two-place jet transitional trainer is 117 mph; it has a useful load of 6,358 pounds.



CONSTELLATION PO-1W A Navy flying laboratory, the PO-1W is a specially modified *Constellation* being used to conduct extensive tests of the Navy's airborne early-warning radar equipment and procedures. The electronic equipment on board the PO-1W extends the "eyes" of the Fleet many miles beyond the horizon. Powered by four Wright engines, this modified "Connie" has a maximum speed of "over 350 mph," and a range in excess of 5200 miles. The *Constellation* has a fuel capacity of over 5800 gallons. This capacity may be increased in the PO-1W version. Note the radome atop the fuselage.

MARTIN

MERCATOR P4M-1 A patrol plane, the P4M is powered by two Pratt & Whitney R-4360 engines, plus two Allison J-33 jet engines mounted aft and in the same nacelles as the Pratt & Whitneys. The *Mercator* has a top speed "over 390 mph," and a service ceiling above 33,500 feet. Its gross take-off weight is over 80,000 pounds and its maximum range is more than 3,000 miles. Electronically equipped for patrol missions, the P4M *Mercator* carries a crew of nine. The plane has a wing span of 114 feet, is 86 feet 3 inches long, is heavily armed.

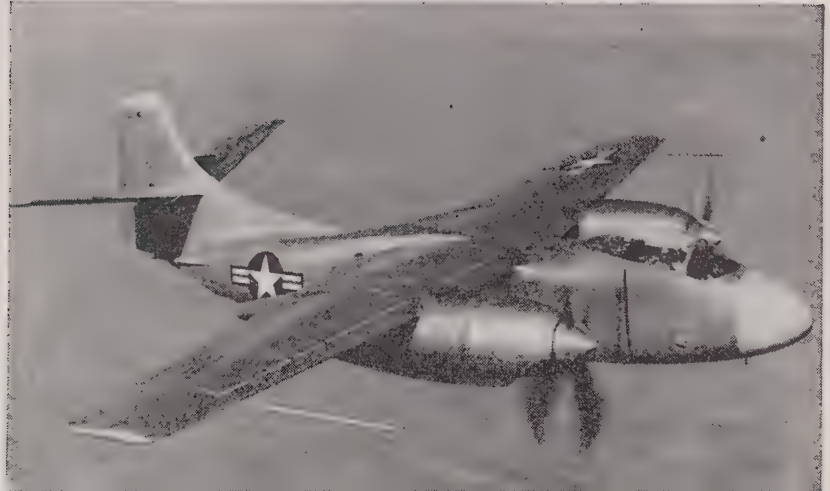
MAULER AM-1 Called "Able Mable" by the Fleet, the AM-1 is one of the largest, fastest and most heavily armed carrier-based dive-torpedo bombers in Navy service. It is powered by a 2,500-hp Pratt & Whitney engine and has a speed in excess of 350 mph. The *Mauler* can fly at an all-up weight of more than 29,000 pounds with a payload of almost six tons. In the photograph, the AM-1 is carrying a payload of more than 9,000 pounds: three full-sized torpedoes, 12 five-inch rockets and four 20-mm aerial cannons. The all-up weight was 25,520 pounds, some 4,000 pounds short of its all-up maximum.

MARLIN P5M Featuring a new type hull which is said to improve performance of flying boats, the P5M is powered by two Wright engines which give it a top speed of more than 250 mph. The new hull is said to reduce take-off time and distance and to permit safe landings in very rough seas. Other figures and facts are classified.

McDONNELL

PHANTOM FH-1 Designed as a carrier-borne jet fighter, the McDonnell *Phantom* is powered by two Westinghouse J-30 jet engines which give it a speed in excess of 450 mph and a service ceiling of more than 35,000 feet. The *Phantom* is 38 feet 9 inches long, has a wing span of 40 feet 9 inches which folds to a compact 16 feet 3 inches for stowage aboard a carrier. It is armed with 50-cal. guns and may be equipped with rockets.

BANSHEE F2H-2 The *Banshee* is powered by two J-34 Westinghouse turbo-jet engines, each yielding 3,000 pounds thrust. It has a top speed of "more than 575 mph," and a ceiling of "more than 50,000 feet." The first service-type fighter with an initial rate of climb of 9,000 fpm, the *Banshee* zoomed to 52,000 feet to set an altitude record for jet aircraft in 1949. It is a single-seater with a normal range of 2,000 miles. This range is extended by wing-tip tanks.

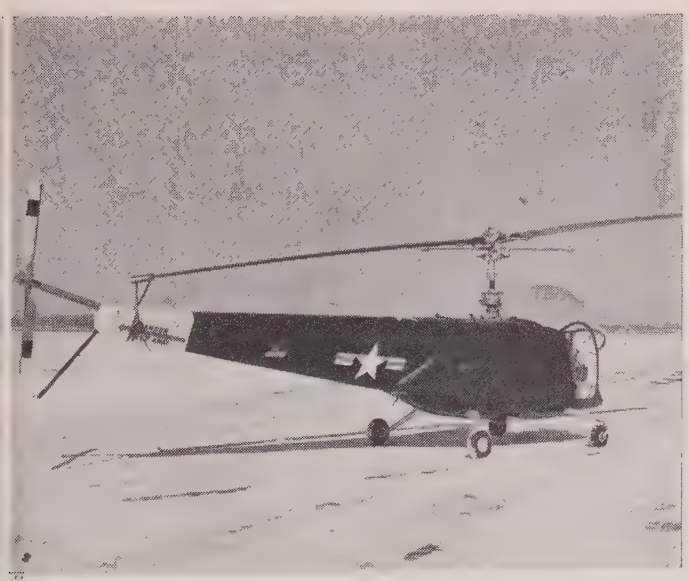


NO. AMERICAN

AJ-1 An attack plane for the Air Navy, the AJ-1 is powered by two Pratt & Whitney R-2800 engines plus an Allison turbo-jet in the tail. The jet engine can be "cut in" for extra burst of speed. The AJ-1 carries crew of three; its wings fold for carrier stowage. AJ-1 can carry an atomic bomb.

SIKORSKY HO3S—In service, but out of production for Navy, the HO3S is a four-placer that cruises at 85 mph; is powered by a Pratt & Whitney *Wasp Jr.*

NAVY 'COPTERS



BELL HTL-2—In service with the Air Navy but out of production, the Bell HTL-2 seats two, cruises at 85 mph and has a service ceiling "above 10,000 feet"

PIASECKI HRP-1—Called the *Rescuer*, the HRP-1 cruises at 100, has 13,000-foot ceiling

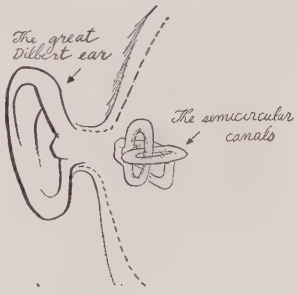
MCDONNELL XHJD—An experimental 'copter, XHJD was designed for air rescue

PIASECKI XHJP—Designed for Fleet use, this 'copter carries crew, three litters, a medic

DILBERT

By S. H. Warner and R. Osborn

Airsickness—Basically, seasickness, carsickness and airsickness are all brothers under the skin. Anyone can become airsick, whether novice or old-timer. The causes are both physical and psychological. Except in a very few cases, airsickness can be prevented or alleviated by an understanding of what causes the condition.



Believe it or not, the ear has a great deal to do with airsickness. Each "inner ear" contains three semicircular canals, the main sensory organs whereby you maintain your balance and orient yourself in space. When you are sitting in an airplane, these canals lie in three different planes (surfaces, not other airplanes) coinciding with the three principal axes of your airplane. Hence, any movement of the airplane affects at least one canal.

Each canal contains fluid and tiny hair "communicators." These hairs telegraph the movement of the fluid to the brain. Unfortunately, when the airplane is making unusual or prolonged movements, especially up and down, a series of conflicting impulses are relayed to the brain because the fluid lags, or continues to move in one direction even after the airplane has begun to move in another direction. In other words, the fluid can't keep up with the airplane's movements, and the hair communicators send false information to the brain. Incidentally, this is the sole reason why you can't fly blind without instruments.

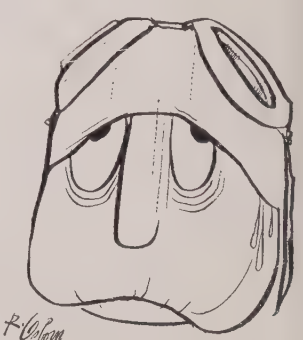
These same false impulses are also relayed to the stomach. They are what cause your nausea. This nausea affects certain persons more than others, but aviators, like sailors, gradually build up an immunity to it. Also, knowing that your senses may play you false at such times, helps you to ignore them.

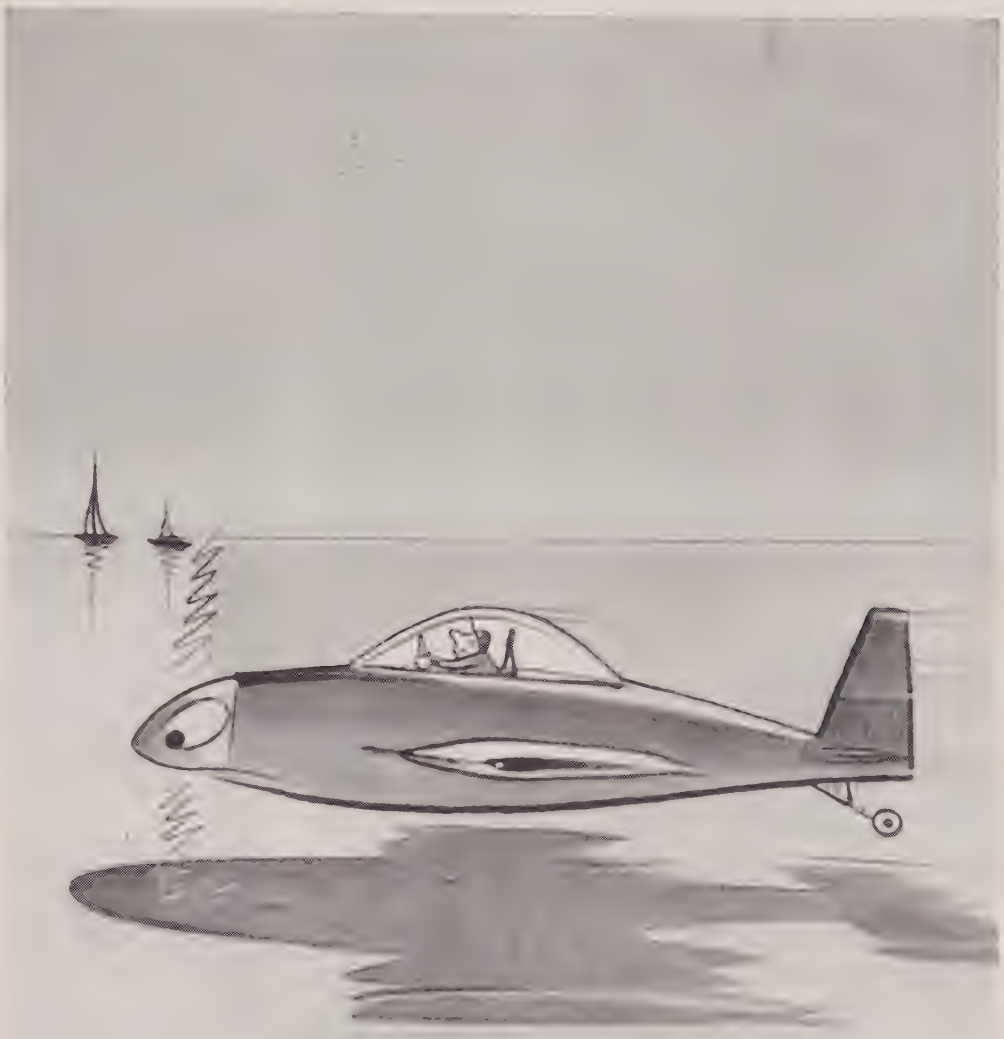
Eyes also are sometimes a factor in airsickness; a natural twitching is set up when the inner ears are disturbed. Eyes should be kept focused on a distant object, and during acrobatics should be kept out of the cockpit except for occasional glances.

Physical condition is important. You can count on being airsick after a hangover. Fatigue, constipation, and over-eating are other causes. Certain foods, such as greasy or bulky foods eaten before flight, are not good.

Certain external factors affect the ability to withstand airsickness. High altitude may cause nausea. Insufficient ventilation, bad odors, constant noise, and temperature extremes are other factors.

Fear or expectation of becoming airsick may be the cause. It is (*Continued on page 50*)





"Low an' slow over water is a Dilbert design for dunking"

CAOA BOARD Chairman W. B. Belden of Republic Steel presented the 1949 CAOA Award to Arthur Godfrey for his outstanding contribution to business flying during past year

CAOA REPORT . .

CORPORATION AIRCRAFT OWNERS ASSOCIATION, INC.

Corporation Aircraft Owners Association is a non-profit organization designed to promote the aviation interests of the member firms, to protect those interests from discriminating legislation by Federal, State or Municipal agencies, to enable corporation aircraft owners to be represented as a united front in all matters where organized action is necessary to bring about improvements in aircraft equipment and service, and to further the cause of safety and economy of operation. The CAOA headquarters are located at 444 Madison Avenue, New York 22, N. Y.

Highlights of the Forum

The 1950 CAOA Forum, held at the Hotel Statler, Washington, D.C., was the most successful yet held. Despite even worse weather than had handicapped the two previous Forums, the total attendance far exceeded that of the previous years. Over 50 per cent of those attending represented companies operating aircraft for business.

Donald W. Nyrop, Deputy Administrator of Civil Aeronautics, was the first speaker. He said in part: "Thanks to your initiative in recognizing and taking advantage of the opportunities which the airplane offers to business men, and thanks also to the efforts of your association in helping to iron out the problems in this new field, business flying has grown faster than any other type of non-air carrier aviation, chalking up an increase of 141 per cent during 1946, 1947 and 1948 . . . I am sure that your corporation executives, who know the dollars and cents importance of promoting safety, will be increasingly important factors in spreading the gospel of air safety."

Brig. Gen. Herbert B. Thatcher, Deputy for Operations, Continental Air Command, warned that in view of the growing seriousness of the international situation, and as our national defense plans go forward, civilian pilots must be prepared to accept increasing curtailment of operations in certain vital areas. He said that it is becoming more and more important for the Air Force to know who is flying in these areas and he urged that flight plans be filed so as to avoid interception by fighter aircraft.

During the discussion that followed the general's talk, T. Wilson (Bill) Hotze of Reynolds Metals suggested that CAOA go on record in favor of filing flight plans as a matter of routine for all flights.

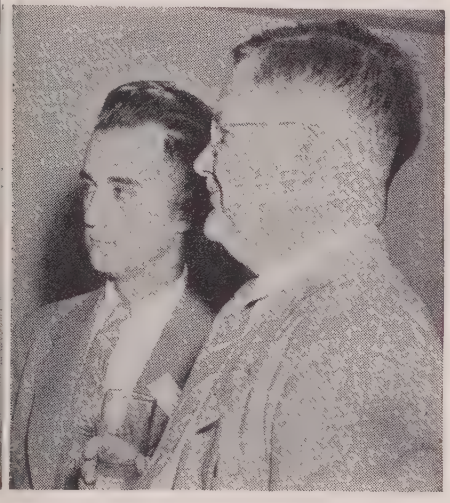
A very practical paper on "Safety in Executive Aircraft Operation" was prepared for CAOA by Jerome Lederer, Director of the Flight Safety Foundation, and was read at the Forum by his assistant, Miss Gloria Heath. At the last moment Mr. Lederer was unable to be present. Starting with an analysis of the six fatal accidents involving executive aircraft in 1948-49 (no CAOA members were involved), the paper went on to deal with the owners' responsibility for *pilot* maintenance as well as aircraft maintenance. Included were valuable and useful notes on overloading, weather reporting, seats, harness, crash and escape techniques.

The paper provoked a considerable amount of discussion, and an effort presently is being made to secure enough copies of it to send to those CAOA members who were not able to be present at the Forum.

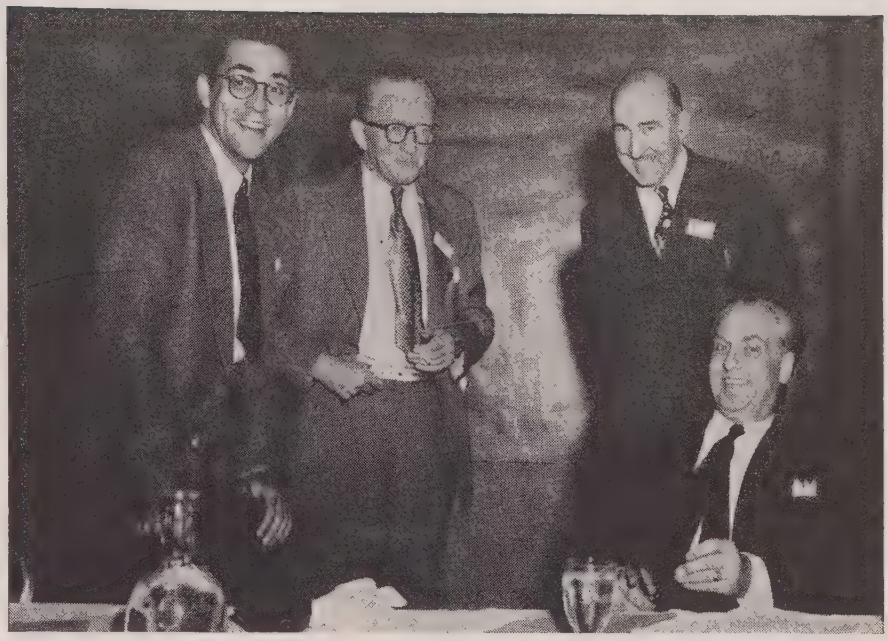
In introducing Melvin H. Nuss, President

CHAIRMAN BELDEN introduces Arthur Godfrey to Forum. Others at table *(left to right)*: N. F. Silsbee, Joe Geuting (Personal Aircraft Council), J. Fred Henry (SKYWAYS-NAVICOM), Al Bennett, Sam Saint and Howard Maurhoff (National Dairy Products, and CAOA Treasurer)

KEY MAN in transition airways program, Sam Saint, was the first afternoon speaker



CHIEF of FCC's aviation section, Ed White, and Case Pilot Halverson listen in on talk



UNITED PRESS' Charles Corddry, Personal Aircraft Council's Don Mockler, Executive Secretary Niel Silsbee, Publisher Fred Henry join in jovial "hangar session" during CAOA luncheon break

of the American Association of Airport Executives, Mr. Belden referred to the friendly give-and-take which resulted from his (Belden's) talk at the AAAE convention at Columbus, and the evidence since his talk of cooperation in the use of main loading gates by executive aircraft. Mr. Nuss stated that the airports were out to give the operators of company aircraft the best service possible as this business was a welcome factor in the postwar flying picture. A study of our Directory had indicated to him that our members get to practically every important airport in the country. He asked that when they observe faulty service, or on the other hand, some exceptionally favorable treatment, to pass the word along. This will assist his organization to "gear our airports to business flying."

At the conclusion of luncheon, Mr. Belden presented to Arthur Godfrey a framed citation embodying the CAOA Award for 1949 for his outstanding contribution to aviation via his radio and television programs. Arthur Godfrey's acceptance speech is given practically in full on page 59 of this issue.

The afternoon session of the Forum featured various aspects of air navigation, communications and traffic control. The first speaker was the modest but highly competent Capt. Sam Saint of American Airlines, chief of ATA's Air Navigation & Traffic Control division, and vice chairman of the Air Coordinating Committee's Operational Policy Working Group. He discussed "Working Out the Bugs" as applied to traffic control. After eliminating several methods which had obvious shortcomings, he submitted the following plan as offering the most equitable scheme for handling the heavy traffic flow of the near future: (1) No arbitrary diversion of traffic from requested destination. (2) Inform pilot in each case what delay penalty will be set up. (3) Equal delays regardless of aircraft class, or distance, or whether the plane is airborne or on the ground.

Joseph Blatt, Chief of the Planning Staff, Office of Federal Airways, then gave a practical talk on "Executive Pilots and Air Traffic."

This was followed by the CAA film on the new airways, covering Omni-range, Distance Measurement Equipment, etc., and a brief presentation of Miss Frances Burr's very interesting and useful 3-dimensional aeronautical charts.

Edwin L. White, Chief of the Aviation Division of the FCC, and his assistant J. J. McCue outlined the subject of frequencies for aeronautical services, procedures regarding applications, etc. and J. S. Anderson, vice-president of Aeronautical Radio, Inc. wound up the afternoon with a discussion of radio service for executive planes.

CAOA Technical Committee's Walter C. Pague and Cole H. Morrow, go into huddle

GENERAL Thatcher and Bill Belden talk it over in CAOA suite at Statler before lunch

PILOTS Bill Hotze (Reynolds Metals) and Walt Pague (ARMCO Steel) relax for chat

Fulton Airphibian

(*Continued from page 17*)

little workhorse with a road stability that is nothing short of amazing.

Parked on the grass in front of Atlantic Aviation was the *Airphibian* "flight unit"—wings, fuselage aft of the cabin, and tail section all in one. This was the first chance I'd had to get a good, close look at both the "road unit" and the "flight unit." Examining the road unit first, we find it's a convertible, all-metal chassis of welded steel tubular construction. It's over-all width is that of the standard automobile, with a 72-inch wheel base. It is 11 feet 6 inches long and 5 feet high. The four wheels of the landing gear are individually suspended, rear-wheel driven, and are equipped with fenders (half pants on the trailing edge of the wheel). The tires are 6:00x6, all wheels have brakes and struts are faired.

The chassis weighs 1,105 pounds. The engine, a 150-hp Franklin, is modified to transmit power to the rear wheels for road operation. The propeller is removed during highway travel. The front wheels steer.

Other automotive necessities include a gear-shift lever, an electric horn, seal-beam headlights (these double as landing-lights), rear bumper, rear-view mirror, tail-light, stop light, floor starter, radio, sunshades.

It's a two-door model with a "snap" convertible top of black waterproof fibre-glas impregnated with plastic. This top can be rolled back either half- or all-the-way, and folded behind the baggage deck. The rear-view plastic window is especially large, and the two door-windows are adjustable.

The *Airphibian's* two-place cabin is soundproofed and weather-proofed, and has a formed plexiglas windshield. The seat and back cushions are resilient, foamex-rubber padded, with a duraleather cover. Sides are upholstered in padded and quilted brown plastic. The floor is carpeted. The baggage deck is back of the seat, and carries unlimited weight as a road unit. When the flight unit is added, baggage is limited to 60 pounds. There's plenty of extra room, too, under the seats for cameras, maps, etc. The gas tank is under the baggage deck.

Polaroid sunshades, compass (in center), and cabin check-light (at right) are mounted at the top of the windshield.

The instrument panel is partly vertical, partly slanting. Most of the engine instruments are flush-mounted on the sloping panel which is finished in the same quilted material as the upholstery, with a matching plastic mounting plate. The instruments are easy to interpret since the panel is sloped right to the windshield. This also provides excellent forward visibility.

The airspeed indicator is paired with the road speedometer right in the center of the panel. Below them on the vertical panel are the varied-shaped knobs of the engine controls, including carburetor heat, primer, mixture, hand throttle, cabin heat, and the light switches. The radio is in the left corner, glove compartment in the right, and tachometer (with built-in engine recorder), ball-turn indicator and sensitive altimeter in between the radio and glove compartment.

The big feature, of course, is the *Airphibian's* control system. The same controls are used for flying and for driving, and always operate in an entirely conventional fashion.

There's a conventional automobile steering wheel for highway use as well as for taxiing and flight steering. The only unusual road-steering feature is the ability of the wheel to be pulled in and out (for elevator operation in flight). Originally, it had been intended to lock this for road operation, but experience proved that adjustable positioning of the wheel was a real advantage, so the lock idea was discarded. Your right rudder pedal becomes the foot-brake for road operation. A hand-brake is also provided for parking and taxiing. The foot-brake is effective only when driving.

The gear-shift lever, with forward and reverse positions, is to the driver's right, set in the floor. You have clutch-free control. The left rudder performs no function in the driving operation. You simply step on the throttle to go, on the brake to stop.

There is a floor foot-starter on the firewall above the left rudder pedal, and a floor foot-accelerator to the right of the right rudder pedal. When you step on the gas, or push your accelerator down to the floor board, you're really opening the throttle only about a third of the way. Look at it this way: 1,000 to 1,500 rpm gives you 20 to 40 mph on the road. About 2200 rpm will give you about 60 mph. The recommended maximum is 50 mph—and remember those speeding tickets! As a car you get 20 road miles to the gallon of gas.

As far as ease of driving is concerned, it's just like any non-flying automobile—if anything, it's a little easier. Perhaps the biggest problem is the stir it creates among motorists and pedestrians alike. One day someone asked Bob Fulton if he wasn't worried about getting run into by surprised and gawking drivers of other cars. Before he had time to answer, someone in the crowd exclaimed: "Run into him? Heck no. Looking at him, they'll run into each other!"

Now, let's look at the flight unit. Bob pulled the parking brake on the road unit, got out and proceeded to convert the *Airphibian* to flight condition.

The flight unit (16 feet 9 inches long, 7 feet 8 inches high) is a high-wing monoplane of welded tubular and sheet-metal construction. The wings are constructed of wooden spars and formed metal ribs. The unit is fabric-covered, and weighs 400 pounds. The wings (span of 34 feet) have leading-edge slots located out near the differential ailerons. These give better stability and an increase in aileron efficiency at slow speeds. The wings are also equipped with three-position, manually-operated flaps. The elevator-trim is integrated with the flap lever, so that in lowering flaps for landing, no re-trim is necessary. The trim handle, which resembles a motorcycle grip, is on the end of the flap-lever.

While parked at the airport, the whole flight structure is supported by wing-wheels and tail-wheel. Under the wings there are vertical supports which double as jury struts. They are connected at the top to the rear spar and the rear lift strut. At the bottom, they rest on full-swivel rubber wheels, making for convenient hanger placement.

There are crank handles at the center of the supports for raising and lowering the structure to the desired position. For outside parking, the "wing-wheels" may be lowered below the level of the tail-wheel, thus creating a zero, or negative angle of attack. This feature, plus tie-down, can resist a wind of gale proportions. The tail-wheel, fully retractable into the fuselage for flight, is full-swivelling and equipped with a crank handle for getting the desired parking position.

On the right side, midway between the wing and the tail, the prop is "hung" when the flight unit is parked. It is a three-bladed, fixed-pitch, wooden prop (certification of the *Airphibian* is for either a 70- or 73-inch prop) that rests on a parking "rack" or "hanger" which slides out of the fuselage at this point.

How do the road unit and the flight unit fasten together? It's so simple and so logical you wonder why it didn't happen before!

The conversion steps are as follows:

1. Adjust height of wing-wheels and tail-wheel.

2. Roll the convertible top down and fold behind baggage deck.

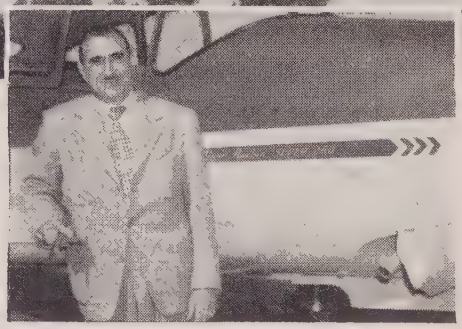
3. Back the road unit in under the flight unit. Front of the flight unit fits over the road unit like a roof, and here's where the security comes in. The wings are actually fastened on more tightly than in the average airplane! "Sky Hooks" on the wings

(*Continued on page 44*)

AIRPHIBIAN has luggage allowance of 60 pounds. As airplane, it is one of sturdiest planes built

"MOST TERRIFIC AIRPLANE I'VE EVER FLOWN"

says* PAUL MANTZ, *famed inter-city speed and movie pilot, 3-time Bendix Trophy Race winner



"Ryan's way out front this year with the *Navion* Super 260!," continues Mr. Mantz, "I've never seen anything like it in my life. Ten minutes to 10,000 feet! That gives you an idea of its phenomenal performance. It's big and powerful . . . it cruises at 170 mph, yet lands at a sensationally slow 55 mph with *full load* and *no wind*. In every way it beats everything I've ever flown. It has both maximum performance and maximum safety. Anyone can fly it easily and safely. Its high altitude performance is amazing. Soundproofing, ventilation, the radio, interior appointments . . . everything is perfect. And that sweet-running 260 h.p. Lycoming engine! It drives the new Hi-Cruise propeller through silent reduction gearing at low RPMs for maximum efficiency and reduced noise level.

"The Super *Navion* is as outstanding in its class as the P-51 Mustang is among piston-engine fighters. And no wonder! They're both products of real engineering leadership. With its 1250 fpm rate of climb, fast cruise and 18,000 foot ceiling, the Super *Navion* has the same 'get up and go' I like so much in my P-51s. It gets off like a scared jackrabbit in just 400 feet . . . in 770 feet I was over a 50-foot obstacle with *full load* and *no wind*. And I found all this in a big, roomy, strong, full-sized he-man airplane that justifies the greatest ease of mind. Only in the Ryan Super *Navion* can you find this wonderful combination.

"Never before has there been a plane of such quality . . . such outstanding performance in *every* way . . . a plane so thoroughly reliable and serviceable. To combine all that in full measure is a master accomplishment."

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The ideal plane for those who want modern, safe air transportation at minimum cost. Features 205 h.p. Continental engine, has 55 cu. ft. cargo space, lifts 1029 lbs. payload with full tanks. Ideal for ranchers, contractors, etc.

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Room for four big people with plenty of luggage in cabin so big it permits changing seats in flight. Superbly sound-proofed and ventilated. Equipped with dual controls, VHF radio, cowl flaps. Safe and easy to fly.

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Lycoming-powered to cruise at an honest 170 mph. Outcruises, outclimbs, lands shorter than anything in its class. The 260 is the *Navion* at its very finest. Write today for complete free information.

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CHART A

RANGE	PAYLOAD				
Still air statute miles	Twin Wasp at 8,000 ft. at 175 mph	Mamba at 10,000 ft. at 165 mph*	Mamba at 10,000 ft. at 230**mph	Mamba at 15,000 ft. at 185 mph*	Mamba at 15,000 ft. at 225**mph
200 miles	9,100 lbs	9,600 lbs	9,500 lbs	9,500 lbs	9,450 lbs
400 miles	8,550 lbs	8,600 lbs	8,350 lbs	8,550 lbs	8,450 lbs
600 miles	8,000 lbs	7,550 lbs	7,200 lbs	7,650 lbs	7,500 lbs
700 miles	7,750 lbs	7,050 lbs	6,650 lbs	7,200 lbs	7,000 lbs
800 miles	7,500 lbs	6,550 lbs	6,050 lbs	6,750 lbs	6,550 lbs
1,000 miles	6,950 lbs				

** Optimum range* *** Maximum cruise power*

Turbo-Prop DC-3

(*Continued from page 19*)

the operator will gain valuable experience with operating turbo-prop airliners when they are available later. The *Mamba*-engined airplane will carry an economic payload and will attract passengers due to the greater comfort provided by the vast reduction in noise and vibration.

(3) The increased power and lighter weight of the *Mambas* enables the airplane to carry a greater payload up to a range of 350 miles, and provides a better performance than the Super DC-3 up to a range of 800 miles (few routes flown by the DC-3 exceed 800 miles), and also makes possible considerably higher cruising speeds with little penalty in range. These increased speeds are still within the maximum allowed by airframe limitations.

As about 1,000 pounds is saved in engine-installed weights, there is an improvement in the payload of the *Mamba*-powered version up to a still-air range of 350 miles. Beyond this range there is a reduction in payload, though not a very serious one, owing to the higher specific fuel consumption of the present-day turbo-prop. However, at this juncture it should be pointed out that improvements in the efficiency of the principal components of the turbo-prop will produce appreciable reductions in fuel consumption in the course of the next year or two.

The two *Mambas* are installed in the wings of the DC-3 with their longitudinal axes in the same position as the *Twin Wasps*, thereby not effecting the thrust line. As can be seen from the accompanying photos, the planes of rotation of the airscrews have been moved forward for C.G. reasons and are now directly in line with the pilot's cockpit. This feature may give ICAO cause to look askance, and the Armstrong Siddeley company fully realizes that. This location will no doubt be frowned upon. However, the present machine is purely experimental and the *Mambas* are so light they can easily be pushed aft or forward of the cockpit.

The engine bulkhead is a stressed-skin unit, so local strengthening was necessary before a hole for 1 square foot of jet pipe could be cut in it. The *Mamba* buttons onto the same lugs as the piston engine, and the fuel system is unchanged. Each jet pipe is bifurcated to go either side of the undercarriage jack. These jet pipes sweep upwards over the top surfaces of the wing and terminate in much the same place as the rear ends of the original nacelles. Armstrong Siddeley originally used much longer jet pipes, but gradually these pipes have been reduced in length, until now the exterior length of pipe is about half that shown in the accompanying photographs. In the cockpit, the original four engine controls (two throttles and two propeller-pitch control levers) are replaced by two levers for the *Mambas*, working on the system developed by Armstrong Siddeley and using a single lever control for each engine. The center portion of the instrument panel is changed, with the rpm, torquemeters, fuel, oil and jet-pipe temperature gages to suit the *Mambas*.

On the ground, noise in the cockpit from the *Mambas* is a typical whine from the rotating components of the engines and a noticeable airscrew or prop swish. Take-off is no different than in any other DC-3, except that it is appreciably shorter. Once in the air, however, performance is much peppier, so much so that at the *Mamba-Dakota's* inaugural press showing at Bitteswell, one air correspondent was heard to remark, "Ah, well, I suppose they will be ordering them for the RAF fighter units!"

At an all-up weight of 28,000 pounds, and including allowances for run-up, take-off, climb to cruising altitude, and stacking for one hour, the estimated comparative performance is shown in chart A (*left*).

The existing fuel tankage of the aircraft limits the maximum attainable ranges with the same allowances as shown in chart A to the following:

Altitude	*Speed*	*Range*	*Payload*
Twin Wasp—			
8,000 ft	175 mph	1,500 mi	5,550 lbs
Mamba version—			
10,000 ft	165 mph	805 mi	6,500 lbs
10,000 ft	230 mph	725 mi	6,500 lbs
15,000 ft	185 mph	850 mi	6,500 lbs
15,000 ft	225 mph	800 mi	6,500 lbs

To meet the ICAO requirements covering the case of engine failure during take-off under ICAO conditions without airframe modifications, it is estimated that it will not be permissible to operate the aircraft above the following (take-off) weights:

Standard *Dakota* (*Twin Wasp*)	23,600 lbs
Mamba-Dakota	26,700 lbs

This immediately reduces the payload that can be carried by the *Twin-Wasp* version by about 4,500 pounds at all ranges, whereas the corresponding reduction for the *Mamba* version is only 1,300 pounds, resulting in a net gain for the *Mamba*-powered airplane of about 3,200 pounds.

Including allowances for taxiing, take-off, climb to cruising height and stacking for one hour, the estimated comparative performance at the stated take-off weight is shown in chart B.

The existing fuel tankage of the airplane limits the maximum attainable ranges with the same allowances to:

Altitude	*Speed*	*Range*	*Payload*
Twin Wasp—			
8,000 ft	175 mph	1,570 mi	1,150 lbs
Mamba version—			
10,000 ft	165 mph	820 mi	5,200 lbs.
10,000 ft	230 mph	725 mi	5,200 lbs.
15,000 ft	185 mph	875 mi	5,200 lbs.
15,000 ft	225 mph	810 mi	5,200 lbs.

On this basis (Chart B, *left*) the *Mamba-Dakota* shows a superior performance at all operating ranges, and can carry a far more economical payload.

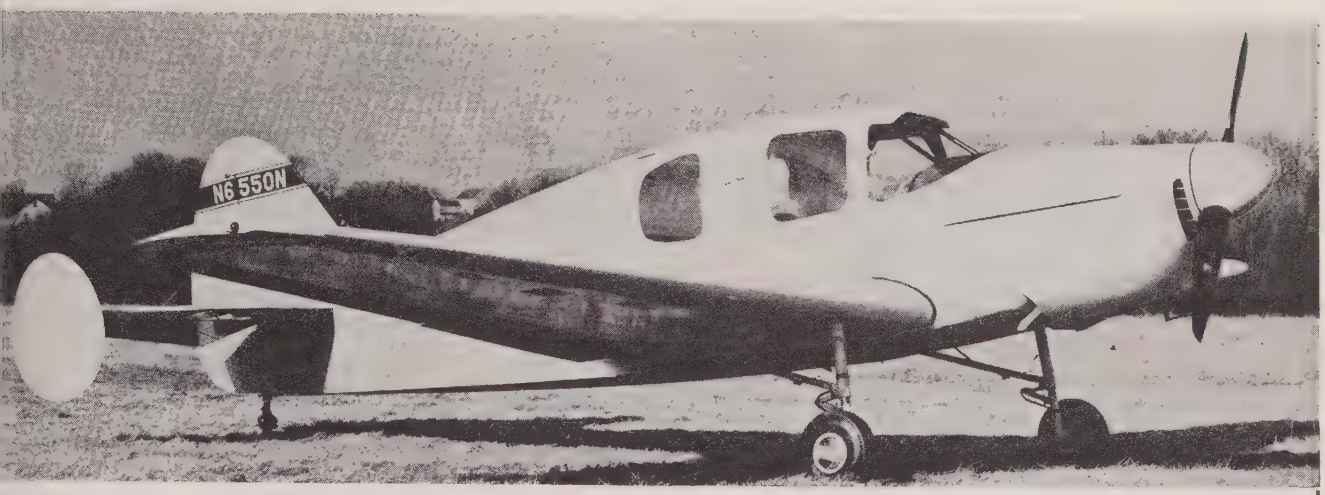
There is no doubt that much interest is being shown by European operators in this conversion, and Britain's unquestionable lead in light turbo-prop development will stand her in good stead if she can secure quantity orders for the conversion of DC-3's to *Mamba-Dakotas*.

In the States, meanwhile, the Air Line Pilots Association does not go along with the short-haul aircraft developed to replace the DC-3, and it has offered up its own design. Whether or not ALPA would approve the *Mamba-Dakota* remains to be seen. Thus far there has been no report, and it is not known whether Armstrong Siddeley plans to discuss the *Mamba-Dakota* with ALPA or not. The European interest in the turbo-prop DC-3, however, is noteworthy and could be profitable to Great Britain. Certainly Douglas would profit by the scheme, for DC-3 spare parts would stay in demand for many more years.

CHART B

RANGE	PAYLOAD				
Still air statute miles	Twin Wasp at 8,000 ft. at 175 mph	Mamba at 10,000 ft. at 165 mph*	Mamba at 10,000 ft. at 230**mph	Mamba at 15,000 ft. at 185 mph*	Mamba at 15,000 ft. at 225**mph
200 miles	4,700 lbs	8,250 lbs	8,150 lbs	8,150 lbs	8,050 lbs
400 miles	4,200 lbs	7,300 lbs	7,000 lbs	7,250 lbs	7,100 lbs
600 miles	3,700 lbs	6,300 lbs	5,900 lbs	6,350 lbs	6,150 lbs
700 miles	3,450 lbs	5,800 lbs	5,350 lbs	5,950 lbs	5,700 lbs
800 miles	3,200 lbs	5,300 lbs		5,500 lbs	5,250 lbs

** Optimum range* *** Maximum cruise power*



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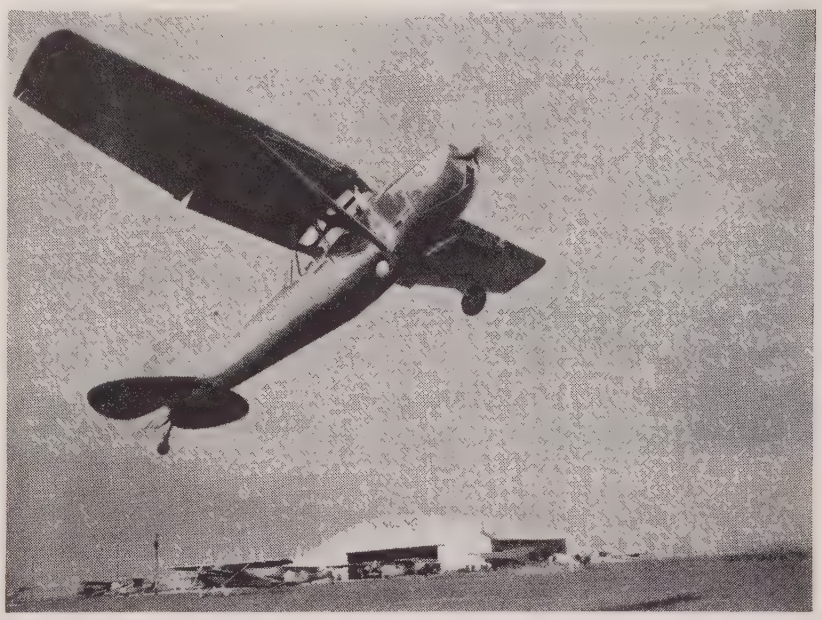

Army Field Forces Entry

Cessna Aircraft Co. has designed a new model for entry in the Army Field Forces' competition for new liaison equipment. Designated the Cessna 305, this two-placer is powered by 190-hp Continental engine and it cruises at 145 mph. Features of the new model are its wide-tread safety landing gear, all-metal construction and high-lift flaps. While using 200-hp for take-off and climb over a barrier (*note its short take-off in photo above*), it cruises at 29 per cent of engine's rated horsepower.

Scramble

(*Continued from page 21*)

numbers plays a vital part as the only tactical air arm of the United States Air Force in Europe. The 36th under the able guiding hand of Col. Richard A. Legg, veteran fighter pilot, provides the main striking force of that tactical arm with the only jet fighter-bomber unit in the European Command.

In the event of hostilities, it would be this small group of jet pilots, the majority of whom are combat proved veterans, who would take the air to give the all-important air-ground support to other U.S. Forces. The past war and all postwar maneuvers have graphically shown the absolute necessity of air superiority if ground forces are to hold or to advance against the enemy.

This then is the mission of Col. Legg's 36th Fighter-Bomber Wing: to keep itself tactically proficient and ever on the alert for any eventuality, to keep constantly abreast of the latest developments, to profit from the lessons learned in World War II and to instill in its fledgling pilots the value of teamwork, so that should the time come when the vicious attack of the 36th's fighters is not merely simulated, it will find its pilots second to none.

Typical of the vigil maintained by the units of the 2nd Air Division and the 36th Wing is the 22nd Fighter-Squadron, which daily trains and patrols the American sector of Germany.

Over the Bavarian Alps a flight of F-80 jets cruise at 35,000 practicing formation and air-to-air fighter tactics. In the lead ship, "Flatfoot One," is the 22nd's Squadron Commander, Major Herb Jordan. Each pilot of the squadron has a high respect for the old man and the wartime victories that are tagged to his name.

Somewhere over the German province of Hesse, Captain Vincent Gorden, Ops officer, takes his flight in on a low-level strafing mission on the gunnery ranges at Schweinfurt, Germany. Only a few short years ago, Captain Gorden, who hails from Pueblo, Col., was jockeying an F-51 *Mustang*, escorting B-17's of the Eighth Air Force. But this time he intends to come home in one piece, not dragging some 60 feet of heavy cable from an enemy airfield as he did on one of his 60 wartime missions, thus earning himself the nickname of "cable kid."

Just forming up over the home base at Furstenfeldbruck, flaxen-haired Capt. John Pedigo of Kansas City, Mo., vectors his "Able" flight off on an intercept mission guided by the ground radar stations that form the intricate net of unseen ears of the 2nd Air Division. Though he's quiet and unassuming to talk to, the men who fly with John Pedigo will tell you he is one of the squadron's most forceful and aggressive fighters in the air. Sitting on an airstrip on D-day plus five was no picnic, yet it was the experience gained there and his 135 other combat missions as an F-47 pilot that made Pedigo a natural for the more intricate job of teaching the younger and less experienced pilots the finer points of fighter tactics.

No group of fair-weather pilots, the jet jockeys of "Dog" flight tag close on the wings of Capt. Robert Berchardt, Milwaukee, Wis., veteran of 1,500 hours fighter time, as he descends through a 6,000-foot overcast during instrument practice. With 78 missions as an F-47 pilot, Bob Berchardt inspires the confidence so necessary in training his flight to become an integral part of this rapidly developing all-weather fighter unit. The pilots of the 22nd continually strive to increase their instrument proficiency, knowing full well that when necessary, the weather must offer no obstacle.

Directly over the control tower, three F-80's roll in perfect unison. As Capt. Harry Evans noses the "Sky Blazers," now famous jet acrobatic team of the 36th Wing, into a perfectly executed Immelman, someone on the ground remarks, "Those two wing men fly as though they were twins." And that they are. Lts. Buck and Bill Pattillo, of Atlanta, Georgia, though only 25 years old, are both veterans of seven years of service and two years of combat. Jokingly referred to as the "Flying Fools," these three, with Captain Vince Gorden flying the diamond, clearly demonstrate the acrobatic ability of this top-flight Fighter-Bomber Group.

As the 22nd, the 53rd and the 23rd Fighter-Bomber Squadrons keep up their daily grind, Col. Legg personally shapes the administrative pilots of his Wing into an auxiliary squadron, qualifying them in jet-type aircraft, instructing them in the latest fighter tactics, and pushing them rapidly towards combat proficiency. Col. Legg has felt for a long time that the desk officers of the supporting units of his organization should be fully qualified in the aircraft of the tactical unit and stand ready to immediately become operational, should an emergency arise.

As Col. Legg puts it, "The 36th Fighter-Bomber Wing is second to none in the Air Force, and in conjunction with the 86th Fighter-Bomber Wing, the 501 AC & W Group and the other units which comprise General Darcy's 2nd Air Division, we stand to any foe of the United States as 'America's First Line of Defense in Europe'."

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RAF CANBERRA, Great Britain's first jet bomber, is now in production. It is powered by two Rolls-Royce *Avon* turbojets which give it high speed, very fast climb

Let's Quit Griping

(*Continued from page 13*)

become enshrined in some ethereal glory.

We need less conscious seeking for a part in Arthurian legend. To heck with the intrepid birdmen theme, the knights in armor on the white charger. An airplane's primary purpose in a modern world is transportation of a superior nature and low-cost-per-mile operation. Used for that, there's nothing wrong with planes on the market today.

We don't need revolutionary designs except for specific tasks, where your machine vies with a tractor for limitation of use.

Those who hope for a shotgun wedding between the airplane, the helicopter, the pack mule, the toboggan, and the submarine should be eliminated categorically until they conclude just what they hanker to do.

We need to put the airplane to work and fusty thinking plus poor merchandising is responsible for much delay. If you are properly equipped in air-transportation needs, the use of an airplane will not only save time and reduce effort, it will be the least costly of the available means of travel.

Business concerns who buy luxury twin-engine transports essentially for show should not complain about the high cost of operation and their inability to work under a 500-mile radius with the same rough-field utility of the *Navion.*

In the same respect, a man who buys a 125 Swift and then wraps it up in a tiny meadow on a fishing trip has no right to bemoan what he calls his luck. Judgment would indicate a *Call-Air* for the eager Isaac Waltons.

Our vanity is partly responsible. You see it all the way down the line. Big companies operate twin-engined ships when perhaps a pair of *Bonanzas* would make them a profit on every mile they fly. People fly *Bonanzas* who probably should be using the Aeronca *Sedan,* the Cessna 170, or a Piper *Cruiser.* You see lots of flying clubs breaking their backs on $4,000 investments in two-placers, that should be flying *Cub* trainers and "Ronk" *Champs.*

Heretofore, we have been overly conscious of time saving and not sufficiently aware of money saving, yet flying will almost always save money if the proper equipment is put to work.

By selling specialization in transportation we have acquired regular customers who charter our Cessna 170 at Central Utah Aviation for trips with a radius of 75 miles, and on some occasions even less. Yet, some experts will tell you that an airplane can't compete with surface transportation under 500 miles. That's plain silly, unless you have bought a pile driver and are now complaining because it doesn't shingle the roof properly.

Something else we have is airport facilities, and these are getting better all the time. We have found that we can fly our 170 Cessna to Las Vegas, rent a car from Alamo Airways, and return for less than we can drive our own car down and back. The same is true at Phoenix Sky Harbor. Recently eight of us in two planes landed there with our goal a football game at Mesa, Arizona. We rented a Buick Roadmaster for the Mesa trip and it cost us six dollars. The over-night use of a Studebaker Champion, 1950 sedan, in Las Vegas was five dollars. Good rest rooms are also becoming more and more common and some of them are equipped with showers and plenty of hot water.

The cost of airplanes today—it seems almost unbelievable to me when I think back 15 years! We recently sold a 90-hp Luscombe *Master* to a Provo attorney who specializes in land jurisprudence. He takes into court his own aerial pictures of disputed property and he also has taken legal authorities aloft for on-the-scene surveys.

This airplane looked like new, and we sold it with the equivalent of a new-plane guarantee, at a fair profit to our company. It had landing and navigation lights, an RCA 116 two-way radio, heater, and sensitive instruments—and less than 300 hours of good flying. We sold it following a 100-hour inspection for $2,430.

This did not "kill" the sale of a new airplane as some people would like to think. On the contrary, it gave a business man a tool he could use profitably in his business—and it practically guarantees the sale of a new plane in 1951.

A few years ago our attorney friend would have paid up to $8,000 for an airplane not half as functional as his Luscombe, and it would have cost him from twice to 10 times as much per hour to fly it.

We also sold a 1947 Bellanca *Cruisair Senior* to a rancher for $3900. The plane had 182 hours on it, and it looked like it had just been pushed out of the factory door, brand new. Ten years ago, for a similar price, he'd have gotten a mechanic's dream and spent unexpected sums on maintenance to fly an airplane that could not compare with the *Cruisair* in any way, shape or form.

The purchase and sale of used planes that can be guaranteed and backed to your word is an important part of every fixed-base operator's business, but only a few of them have learned it yet.

The greatest blight within our professional ranks is the fellow who viciously attacks his competitors' airplanes and winds up by driving customers completely out of the airplane market.

And, I've seen a few characters in the past unload junk airplanes on unsuspecting customers, thinking that they were being pretty smart and pretty important. This class of operator has driven a lot of people back to automobiles and trains and away from the benefits of personal-aircraft ownership.

We believe that any used plane should be sold with an annual inspection up to date on the plane and a full 12 months of operation ahead without parasite fees.

It is possible today to anticipate flying a full year without a major blood-letting of the bank roll. Just look at what we have in engine reliability on the tried and tested models. We recently couldn't stand the idea of flying an aircooled engine with over 1300 hours on it, so we pulled a 65 Continental out of an Aeronca *Champ* and sent it up for major.

To the best ability of skilled mechanics to tell, the engine was in good condition; so good that a major overhaul was a mere technical formality. Yet, if a man's automobile had 100,000 miles on it and still worked all right, he'd not have to buy a new engine just to satisfy himself that he was safe.

Yet, people still act as though we were flying the OX-5, the J-3 Wright, the Gnome Rotary, or the bilious Liberty. Kick about engine upkeep! They ought to have flown behind one that was in a constant stage of major overhaul 24 hours of the day.

What about places to go? There's a regular crew at the wailing wall sobbing over that theme. We can never hope to rival the automobile here, but today you can get to more places in North America by personal aircraft, to land on bona-fide airports, than you can reach by bus, train, or airline service. Once you add training, judgment and proper adaption of equipment to the job requirements, you get a functional utility from aircraft by landing in fields of your choice that nothing else will rival.

I have a 1941 Oldsmobile going on 10 years old. It now has only 30,000 miles on it. Yet, when I travel for either business or personal pleasure, my budget is such that I am constrained to go mostly by the means that costs the least amount of money. And I find myself flying nine times out of 10. If we drive our family to Yellowstone Park in the car, it is considered a luxury trip in the Jense family.

Although I'll have to admit that the Olds '50 Rocket is a mighty fancy looking vehicle, I believe that with only a fraction of the money to work with, our aeronautical engineers have brought greater advancements to the airplane since 1941 than the auto engineers have in the production of the 88 Olds.

Equal importance must be attached to the improvement in CAA cooperation with both the pilots and the industry. We've got the best crew of CAA men we ever had and, when contrasted with their predecessors, it's hard to believe they sprang from the same race. I can remember one such anthropoid in the past who thought it was funny when he forced a pilot into an irrecoverable situation on a simulated forced landing and washed out a $4,500 airplane. You see less of such attitudes in CAA all the time and it deserves some attention.

What, indeed, have we not got? All-metal construction at low cost—stall-resistant airfoils and empennage combinations—dependable stall-warning indicators—crosswind landing gears—even better radio coming up, and Omni ranges to home on—not tomorrow . . . today!

You can get aviation insurance at lowering rates, and many companies no longer penalize regular life insurance policies with aviation clauses.

It is fantastic to me that in 1949 you bought a new four-place Piper *Clipper* for $3,000. I've seen less airplane come out for $12,500 in the days of the depression when the dollar was worth twice as much money. That, my friends, is the equivalent of $25,000 of our kind of 1950 money. Just what do the critics think they want when they talk about high costs?

We've got some troubles, though. It will be a great day if aviation ever outgrows the fly-by-night promoters.

We recently did a job-analysis for a prospective customer, taking into consideration his bank roll, his potential requirements, how many people he'd want to carry, what he could afford on an initial investment and on a cost-per-hour basis. Our primary interest was to find a plane that fitted him—be it *Navion, Bonanza,* Cessna, Aeronca, Piper, Ercoupe or any other.

We felt that with his degree of pilot skill, and the amount of regular flying he would do, plus all other factors, his most logical choice in the price he wanted to pay was a used, metal-winged 170 Cessna. Remember now, on other comparable assignments we had already selected the Luscombe, the Bellanca, *Bonanza* and a *Navion* as having the best dollar value potential for their respective jobs, and no matter what plane we recommended, we would make a fair profit.

The plane we backed is one that he can fly, that he can fly safely, that he can afford to buy and also afford to operate, and it is available *today* at the lowest price such equipment has ever been available.

Well, I'm sorry to tell you, that man's mad at us. He's downright uphappy with me and my partner, Edgar (this is no joke) Allan Poe.

The day we expected to sell him the ship he could have been using every day all winter and spring, he came rushing madly out to the airport waving a page torn from an aviation magazine. On it was the picture of an airplane that has so obviously violated a couple of basic patents held by other company officials, it is certain to wind up in lawsuits the day it is put on the market.

Certain essential features of its engineering make it impractical for the job our customer wants done with his plane, and on top of that it is an untried, unproved model.

(*Continued on page 51*)

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Fulton Airphibian

(*Continued from page 36*)

engage the chassis of the road unit, both front and rear. Three lock-levers then drive four pins into locked position and cannot be unlocked except by hand . . . both hands! The lock-levers also serve to bring road and flight units into the exact position before the pins are inserted. In addition to all that, a crank handle located front and center on the baggage deck inserts three more steel pins into the flight unit at the bottom of the fuselage. Total . . . seven secure connections. As the two units are brought together, the control cable elements (at base of both road and flight units) automatically engage and synchronize. The controls are guided on rollers, meet and remain together. They operate as a series of pushrods. Though the conventional three-control aircraft system is employed, inter-sprung rudder and ailerons permit two-control operation if desired.

4. Attach your prop after removing it from the "hangar" which slides back into the fuselage and is covered by a metal plate. The prop is attached to the engine by a large, built-in bolt which screws into the front of the crankshaft. Eight studs in the prop engage corresponding holes in the crankshaft flange. An integral wrench which telescopes into the center of the bolt, permits easy tightening of the assembly. Two pins in the end of the wrench handle lock the bolt after tightening. The locking pins are locked with bale and spring-plunger which in turn is locked with the spinner. The spinner requires a pocket key to install or remove. Thus, unless each step in the attaching sequence is properly performed, the spinner will not go on. And once on, no one can remove it without the key.

5. Lastly, you retract (by cranking) the wing-wheels and tail wheel. The tail wheel is on a pivot and a spring pulls it up into its well. A pin automatically catches it at top and bottom. A hinged cover closes under it and is secured in place with a quarter-turn cameloc fastener.

Now, you're ready to fly. This whole operation, presented to you in considerable detail, takes the average guy who has already done a day's work just 4 minutes—no more. If you start out fresh, you can do it easily in 3½ minutes. No tools to hunt for, no help required. You can do it by yourself.

How do you know you've got everything squared away and hooked up properly? That's where the safety devices come in. When you are ready to fly your *Airphibian*, the first thing you do is flip on your checklight toggle. It's on the panel next to the master switch. There is a switch at each important point of attachment between the road and flight units. Unless each switch is "closed," the checklight won't light. Let's say you have a lapse of memory or the bulb is burned out and you decide to go anyway. If the job hasn't been completed, your self-starter just won't work!

A word here about inspection and maintenance: the whole machine is set up to make both as easy as possible. The automobile-hood cowling, secured by six cameloc fasteners, can be removed in any or all of its three sections. The floor board comes up with the removal of four fasteners. The interior-cabin upholstery is in sections which can be slid out for work on the chassis. The closure inside the front of the fuselage is quilted, sound- and water-proof. It has a long zipper for easy access for inspection and maintenance of the fuselage control system. The battery is behind the seat. In short, everything is easy to reach.

Now, with everything checked and okay, we "buckled" in and fired her up. As we taxied out, we cleared with the tower for take-off to Idlewild (New York International) Airport, our first stop. We landed at Idlewild 20 minutes later in a 27-mph SSW wind with 30-mph gusts and crossed about 50°. That four-wheel gear provides a secure feeling in crosswind operations. In fast turns, it's stable and "all there," too.

Leaving the flight unit to be tied down by the airport attendant, Bob performed a quick disconnect of the road unit, and we drove the two or more miles to the CAA Administration Building, and parked out front. Bob had some final reports to turn in, and all the men in engineering accompanied us back downstairs to have another look. Region I of the CAA certainly got a boot out of certificating the first airphibious vehicle!

We drove back to the airport and took off for New Castle, Del. There was a pretty fair headwind at 3,000 feet, but we made good time. We gassed up at New Castle and continued on. Just outside Baltimore we spotted a large former Navy airport. Bob and I swapped places and from then on I collected my flight data on this new vehicle.

I landed first with power off, no flaps. Your first landing, like mine, is apt to be a bit high because the *Airphibian* sits fairly low and you don't realize you're that close to the ground. But in spite of it she sat down squarely and firmly on the runway and showed no tendency to bounce. Once those four wheels are on the ground, it's as easy as driving a non-flying automobile along a runway. You just steer with the wheel, using the handbrake to stop. Its ground handling characteristics are really remarkable and should go a long way toward making the *Airphibian* popular.

Using just wheel and throttle, I taxiied back to the end of the runway, lined up and took off. You get about 2250 rpm at take-off, correct for a bit of torque, and she flies off solidly at about 60 mph. The normal climb of 600 fpm seems fairly gentle and shallow.

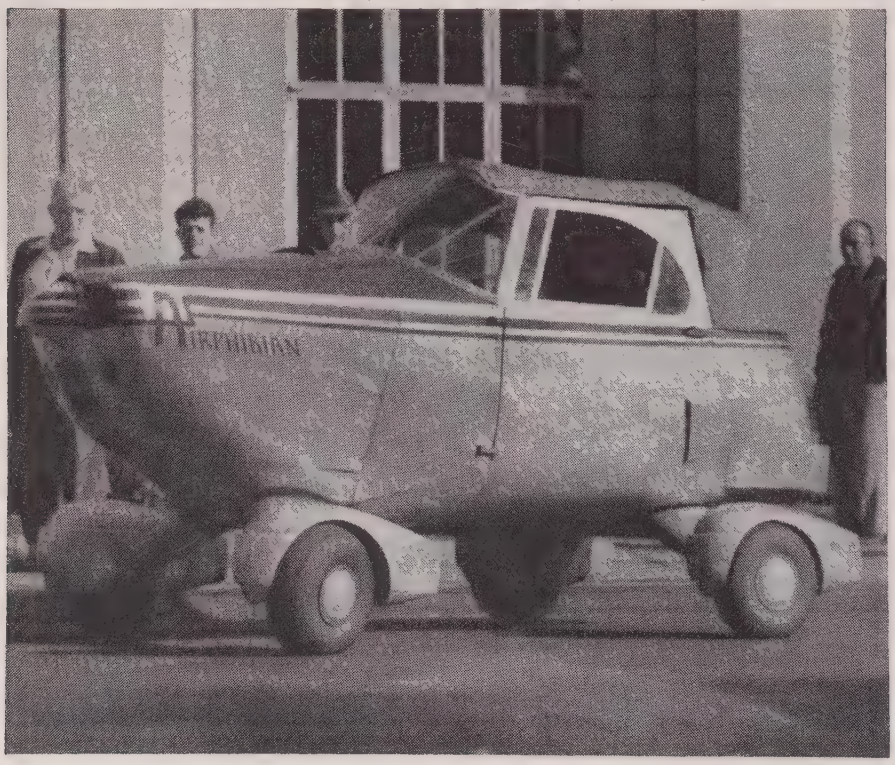
I picked up some altitude and tried some stalls. The *Airphibian* flies a lot like a Stinson, but is a bit more solid on the controls. The power-on stall gives a clean break after a considerable "waiting" period, and recovers with a short pop of the wheel. Power-off, you get good maneuverability and lasting aileron control right through the stall. You've got a job on your hands if you want to spin her, however. It was all the test pilot could do to get it into one. Applying full power and a lot of control manipulations at just the right moment produced a left spin, but a spin to the right was next to impossible. All that usually results is a long spiral turn with a comfortable build-up of speed and easy control. Even when spun, freeing the controls is all that's needed to straighten the *Airphib*' out.

Cruising at 2350 to 2400 rpm gives you 112 mph. At maximum 2600 rpm, you can get 120 mph.

Whether or not the low CG, the soft seat, or the four-wheel gear does the trick, I can't say, but the *Airphibian* certainly is a comfortable, smooth "driving-riding-flying" combination.

You can put her down on all four wheels at once, or on the rear two first. On all four, the wing has little angle of attack so you're going faster. On the rear two, with

CAR UNIT of the *Airphibian* is sturdily built and it can keep up with any conventional auto



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flaps and no power, she touches at about 50 mph, then gently pitches forward on all four. This pitching action ends what's left of the wing's lift, eliminates any tendency to bounce and supplies good steering traction. A ground loop in the *Airphibian* would have to be deliberate.

We continued on to Washington. It was fairly dark when we approached the city, so I switched on the Nav lights and called the tower at the National Airport, "This is *Airphibian* One-Zero-Four, east of the field, 1,000 feet, etc." The tower apparently advised a DC-6 in the vicinity as to our whereabouts and, though we didn't hear the Captain's remark, we heard the tower reply to him: "Yeah—it's an automobile . . . one mile east at 1,000 feet!"

You can become rapidly spoiled by the *Airphibian*. We waved off the station wagon from Butler Aviation when the driver asked if we wanted transportation to town, and with a polite "No, thanks," Bob made another quick "disconnect" and we drove into the city.

For the next two days, the road unit was in constant use. In the case of separate meetings or business appointments, Bob dropped me off or I dropped him off, or we parked the *Airphib'* in the nearest lot. Bob also gave some demonstration flights on that second day, so he practically commuted all day Thursday.

We decided to leave late Thursday afternoon. Bob Fulton and I met again, drove out to National Airport and then "connected" for the flight back home to New York.

I took off from National Airport at 5:56 P.M. and landed at Teterboro at 8:10 P.M., just 2 hours and 14 minutes later. We parked the flight unit, tied it down, and then drove into downtown New York. At 8:55 we were studying our menus in a midtown restaurant. Later, Bob dropped me off home and continued on to his RON.

Next morning (Friday) I drove the *Airphibian* back out to Teterboro while Bob drove my 1948 Plymouth. He clocked exact mileage and average road speed and I began adding up the statistics. The total figures were both enlightening and surprising. The tachometer-recorder showed 790 hours when we left Manhattan, 801 when we returned. Here is the box-score of the basic facts:

	By Air	By Road	Total
Mileage	615	174	789
Hours	5:45	5:15	11
Trips	7	41	48
Average Trip Mileage	88	4½	—
Average Speed—combined air and road operation		73 mph	
Fuel Consumption—combined air and road operation		15.8 mp gal.	
Time Saved by flying		9.7 hours	
Taxi Fares Saved		$52.20	

Note the mileage flown was 3½ times as great as that driven. But the number of road trips was almost six times as great as the number of flights. Each form of transportation was used where it was most efficient: cross-country by air, and locally by road.

If the 615 miles had been driven in a non-flying automobile at a good average of 40 mph, it would have taken 15½ hours instead of 5¾, a saving of 9.7 hours—or more than one man-day *in less than three.* At that rate a still faster flying machine might be in order until you note what taxis would have cost for the 174 road miles, to say nothing of the inconvenience of getting 41 taxis.

Applying this now to all your travels, not just cross-country, not just local, but to everywhere you go or want to go, to the other end of the land or just down to the corner store, the movies or the club, to business, or on pleasure trips, it spells *utility* 24 hours a day 365 days a year. And since the most expensive part of any vehicle is the number of hours you *don't* use it, it spells real economy too.

Bob has had to weather with patience and fortitude all kinds of skepticism about his idea. At first it was just a dream with only faith in its advantages to spur it on. But now he is accumulating *facts* that back it up. With CAA approval in the bag he goes immediately into production. But, being a good business man as well as an engineering-idea man, he plans on letting demand control production. It takes time to build public confidence in any new development—let alone something as progressive as the *Airphibian.* But with such a vehicle to travel in, Bob should not lose much time getting there. The *Airphibian* certainly offers "Utility Unlimited."

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(*Continued from page 10*)

tight pod. The pilot peered out of the cockpit, then circled his finger and thumb in the familiar okay signal. The mechanics stepped back as the blast tube flamed to life. There was a momentary pause while the turbines climbed to a screaming speed. The airplane quivered, then shuffled onto the eight-mile runway that stretched across the gleaming sand flats. It gathered speed . . . faster . . . faster . . . faster . . . one mile . . . two miles . . . three. The pilot touched a switch. Four rocket tubes blasted into life, rolling a cannon-like rumble across the arid desert. The stubby, sweptback wings of the needle-nosed airplane clawed at the air. The wheels left the sand. The stubby wings strained upward under an air load of more than 125 pounds per square foot.

In the cockpit, experienced fingers adjusted the controls. The angle of attack changed slightly, and the wings bit more firmly into the air. The airplane surged forward then upward in a fire-trailing arc. Within seconds it was just a white speck in the blue sky. Then it was gone from sight entirely.

Engineers bent tensely over their radio receivers to keep in touch. The sweat that streaked each face was not caused by the desert sun.

The airplane was the Navy-sponsored Douglas-built D-558 *Skyrocket*. The man in the cockpit was Gene May, one of the nation's best civilian test pilots. The event was the first assault on the sonic barrier by an airplane that could take off and land under its own power.

Years had passed since plans for this flight were made. They were busy years, fraught with danger and achievement, and productive of a tremendous amount of data concerning high-speed flight and high-speed aircraft design. The plans had begun on VJ Day. While the rest of the country celebrated victory, Navy, NACA, and Douglas engineers met in a secluded round-table discussion. Speed was the subject in debate. Super speeds . . . speeds beyond the speed of sound.

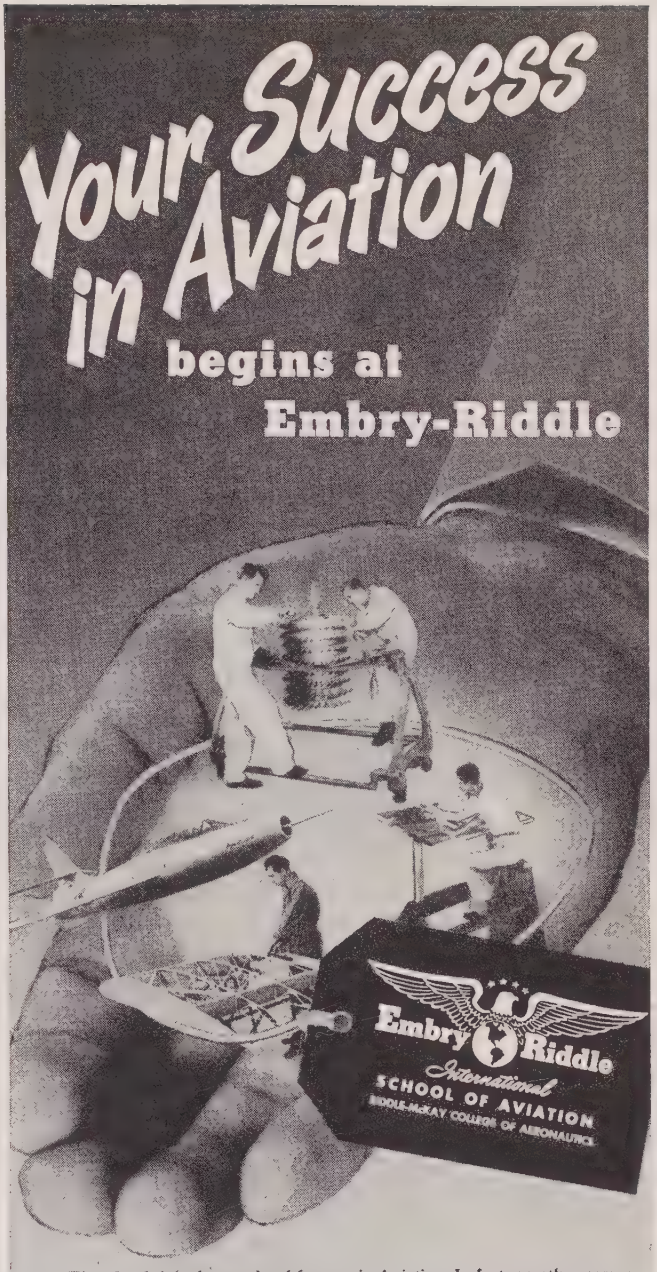
It was a bold discussion. These men talked in the shadow of the sonic wall, the sky barrier to speed beyond which many claimed man could not pass . . . and live. And there was evidence to substantiate these dire claims, evidence in the form of mauled and battered airplanes and dead or bruised bodies of pilots who, in power dives, had ventured too near this invisible peril in the sky.

And the stories that had been told by those who managed to live were not encouraging. Some had told of a thousand devil-gremlins who descended suddenly on the airplane, each with battering-ram force. Others had told of wings, tail surfaces, or controls plucked away by a giant invisible hand. Some had mentioned controls which for no reason at all had seemed suddenly locked in the grip of a mighty vise. The stories were akin in one respect. Each hinted of unknown forces in the sky that made themselves felt whenever an airplane approached sonic speed. The exact nature and magnitude of these forces—how they were generated and ways to overcome them—was still in the limbo of the unknown.

The engineers at that VJ Day meeting did not try to solve these problems, nor to deny or justify their existence. Instead, they made plans to progressively uncover each problem, establish its cause and, if possible, to make design changes that would nullify its effect. It was decided that two purely research airplane models would be built. These airplanes would be literally "flying test tubes" so completely instrumented that every force encountered in high-speed flight could be measured and its cause determined.

The first airplane would incorporate all the knowledge then at hand concerning high-speed design. It would be used to explore transonic-speed phenomena. The second airplane, Phase II of the D-558 program, would incorporate all the knowledge gathered while flying the first and, if the program progressed according to plan, would be used in an attempt to penetrate the sonic barrier. It was one of the most daring yet basically sound, steadily progressive and time-consuming research programs ever attempted by the aircraft industry. In substance, it was like scaling a mountain with a ladder, building and testing each rung as the climb progressed.

The task of designing and building the airplanes was given to the El Segundo plant of Douglas Aircraft Company. Work was under the direction of T. E. Springer, plant (*Continued on page 48*)



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TRAIN IN MIAMI--AIR CAPITAL OF THE WORLD

Mission D-558

(*Continued from page 47*)

manager, and E. H. Heinemann, one of the world's most prolific aircraft-design engineers and who's been chief engineer since 1936. Gene May, despite his advanced age (for a test pilot), was appointed engineering test pilot. May's long record as a successful test-flighter, his ability to calculate risks, and his undramatic attitude toward his work, was an ideal combination of qualifications that proved of valuable significance in the program's success.

May's attitude toward experimental test piloting is summarized in this brief statement: "It's a precise, scientific profession. Hazardous incidents occur as an exception, not as a rule. You must understand the job so that you won't be afraid—people fear only that which they do not understand. Most important, you've got to have complete confidence in the engineers who design and build the airplane you must fly. This confidence must be so great that you just go up, do the jobs the engineers tell you the airplane will do, then come down."

With all plans made, the D-558 program swung quickly into high gear. The first airplane, the D-588 *Skystreak*, was ready to fly 18 months after its conception. The appellation "flying test tube" fitted the crimson little speedster. The cigar-shaped fuselage and thin, stubby straight wings, except for space occupied by the TG-180 jet engine and fuel tanks, were crammed with instrumentation. More than 400 pressure take-off points were distributed over the wings, fuselage and tail surfaces to determine the exact nature of airflow at high speeds. Dozens of temperature take-off points told the story of increased skin temperatures caused by air friction during high-speed runs. Hundreds of strain gages dotted the structure, detailing every flight load that occurred. Colored oscillograph films were used to aid in unscrambling the mass of data automatically recorded during each flight. The cockpit was pressurized and refrigerated to keep it cool. In the event of an emergency necessitating pilot escape, the fuselage was designed to fall apart like a trick cigar, with the pilot ejected from the rear of the nose section.

For two long years Pilot Gene May jockeyed the *Skystreak* into the stratosphere above Muroc Dry Lake and made it do the things the engineers told him it would do. Hundreds of flights were completed. The automatic instrumentation ground out reams of data during take-off, climb, at high and low altitudes, and during numerous power dives. Pilot observation supplemented the recorded information. Phenomena engineers had long believed to be true were substantiated; other popular conceptions were blasted. There in the bright sky above the hot Mojave, his compact frame crammed into the cockpit of the little research airplane, Gene May opened new doors on the problems of subsonic and transonic flight.

"Data gathered during the *Skystreak* phase of the D-558 program is already being used throughout the aviation industry," May points out. "Current problems of high-speed airfoil design, control and stability depend upon this data for solution."

E. H. Heinemann says that data gathered in test flying the *Skystreak* prior to its acceptance by the Navy justified its entire cost.

In August, 1947, Navy Commander Turner Caldwell, Jr., after extensive briefing by Gene May, entered the cockpit of the *Skystreak* and flashed to a then new world's speed record of 640.7 mph. A few days later, Colonel Marion E. Carl, U.S. Marine Corps, stepped into the little speedster and raised the record to 650.6 mph. How fast Gene May flew the *Skystreak* will probably never be told, for it is the test pilot's lot to "iron out" an airplane, then turn it over to others for official performance data.

The *Skyrocket* was the No. 2 plane on the program. Incorporating all the high-speed design knowledge gathered from the flying of the *Skystreak*, the *Skyrocket* is, perhaps, the most powerful true airplane for its size ever built. The slim, needle-shaped fuselage houses a jet engine with 3,000 pounds static thrust, and four rocket tubes which, fired simultaneously, can produce a 6,000-pound thrust for 80 seconds. The thin, stubby swept-back wings of the craft, only 25 feet from tip to tip, look even shorter against the *Skyrocket's* 45-foot fuselage. The rocket motors

AERONCA OFFERS SEDAN AND CHAMPION

The new Aeronca *Sedan* is more of the same good airplane that was "proved in 1948, improved in 1949." Powered by 145-hp Continental engine, the four-place *Sedan* cruises at 114 mph (full gross weight) at sea level, has 120-pound baggage allowance, and a range of some 456 miles. The new *Champion* for 1950 features a straw-and-red color combination that gives the impression of greater length to the fuselage area. Powered by a Continental C90-12F engine, the two-place *Champion* cruises at 100 mph, has a baggage allowance of 50 pounds and a range of 351 miles. It is particularly adaptable to farmer needs, air school operators, etc.

consume 3,000 pounds of fuel during the 80-second run; a fuel similar to that used in the German V-2 rockets.

The *Skyrocket* flew for the first time in February, 1948. The take-off was clean after gaining a 200-mph groundspeed. A 20-second rocket burst is generally used during the final phase of the ground run to assist the heavily laden airplane into the air.

For more than a year following that first take-off, silver-haired test pilot May (a grandfather now), felt out his supersonic "baby" to his complete satisfaction. More high-speed data was gathered. More than 5,000 technical reports and papers found their way into aviation channels to bolster knowledge concerning high-speed flight, but it was a year of silence as far as the outside world was concerned. Only those deeply "in the know" were aware of the drama being enacted almost daily in the bright desert sky. A fire-trailing slivver of white might appear briefly in the bright blue void, only to be gone again before eyes could be focused and conclusions drawn.

Then on June 24, 1949, at an altitude so low that most engineers still regard it as impossible, Grandfather Gene May kicked the throttles wide, pulled out all stops, and knocked the "sonic wall" clear out of the sky. For the first time, an airplane that could take off and land under its own power flew faster than the speed of sound (763 mph at sea level, 660 mph at 35,000 feet).

In numerous flights during the past months, Gene May, at the controls of the *Skyrocket*, has raced with sound and won. His top speed is a guarded military secret. The altitude to which he has climbed cannot be told. But one thing has been made certain —the "sonic wall" as it represents the speed of sound, and once thought by engineers to be the topmost speed at which airplanes could fly, is no more. From now on, or so it seems, speed in the air has no fixed limitations. Man's long-cherished dream of cruising through space, a feat that will require a 25,000-mph terrestrial take-off speed, has been released from the realm of fantasy and made a distinct possibility.

Gene May shrugs impatiently when you mention his "punching holes in the sonic wall."

"The sonic wall was purely a figment of the imagination," he says. "The term was used to designate the transonic-speed range between subsonic and true supersonic speeds. It does not exist as a permanent and fixed portion of the speed spectrum, but is a function of aero-dynamic design and power available. Some airplanes enter this transonic region at 300 mph, others at 500 mph—wherever the air begins to flow at supersonic speed around some contour of the structure. The region of true transonic phenomena, if it exists at all, is very narrow when the proper airfoil design is used. In the *Skyrocket*, there is a very slight sensation of roughness just before you exceed the speed of sound. After that, everything is as smooth as a kitten's ear!

"The big sensation," he adds as an afterthought and with a grin, "comes when you first fire the rocket tubes. When those rockets take hold, you feel like you're a brother of Buck Rogers! The next sensation comes after you exceed the speed of sound. Then everything becomes strangely quiet. It seems that if my pet kitten were in the cockpit with me, and I were to say "kitty" in a whisper she'd hear me and jump into my lap!"

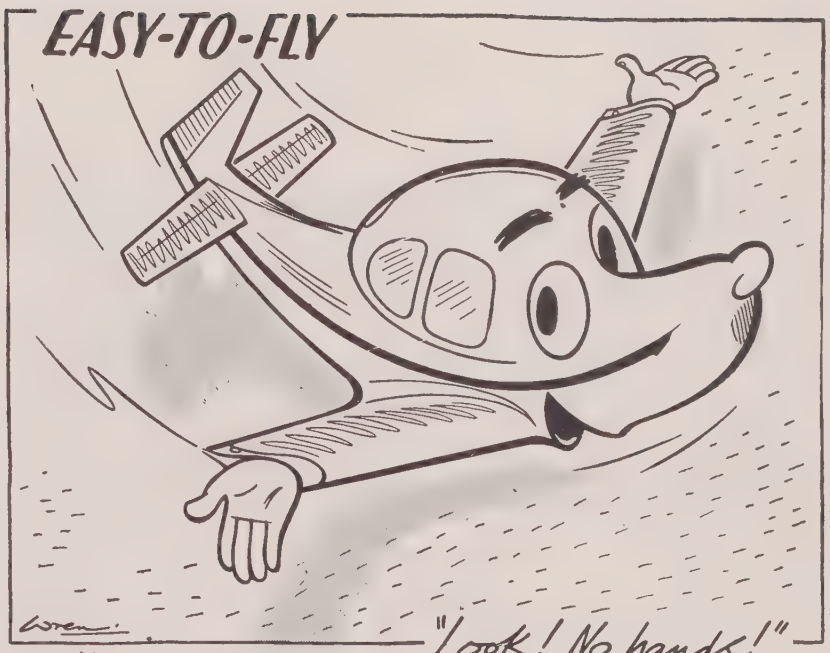
May's coolness in an emergency and his ability to analyze a risk without bias, two characteristics which carried him unscathed and without serious incident throughout the most intensive high-speed research program ever attempted, was vividly illustrated during the first public demonstration of the *Skyrocket*. During the take-off run, the rocket tubes did not fire as smoothly as they should. Despite the fact that nearly a hundred newsmen, magazine writers, newsreel cameramen, and radio commentators were watching with their characteristic "I'm-from-Missouri" attitude, May refused to make the flight. But a week later, all skepticism vanished. Before the same group, May sent the *Skyrocket* skimming at a 50-foot altitude across the Mojave at a speed estimated at 800 mph.

"Testing jets is, if anything, simpler than testing airplanes powered with reciprocating engines," May says. "There are fewer engine controls, and you don't have propeller adjustments to contend with. The difference between experimental testing and conventional testing is one of timing. The production test pilot must keep thinking about one-and-a-half times the speed of his airplane. The experimental test pilot must think at least twice the speed of his airplane. That means if you are flying 500 mph, you must time your actions as though you were traveling 1,000 mph."

"Finis" has not as yet been written to the D-558 program, but its major contribution, that of proving that conventional airplanes can safely fly faster than sound, is already chronicled in aviation's history. Both the *Skystreak* and *Skyrocket* versions have been turned over to NACA engineers for further research and study. Gene May has fulfilled one portion of his contract as the D-558 program test pilot, and others are now sharing the controls.

But the program stands forth as a brilliant example of what can be accomplished by a forthright assault on a series of problems and their solution one at a time. There was no period of doubt, no let-up in effort from the time the plans were made until news flashed around the world that the *Skyrocket* had taken off under its own power, had flown faster than sound, and landed again with both plane and pilot no worse for the experience.

If a scroll were to be awarded to all Douglas, Navy and NACA workers engaged in the program, five simple words would tell the D-558 story . . . "Mission accomplished according to plan!"



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Dilbert

(*Continued from page 32*)

easier for the person who has once been airsick to become airsick again, merely from an association of ideas. Thus, the instructor who subjects his student to repeated acrobatics too soon may be contributing to a condition of chronic airsickness.

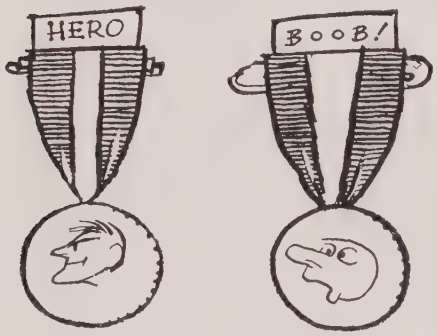
How to prevent or minimize airsickness:

1. Forget about it. Think about anything else, preferably your flying job.
2. Nod head occasionally onto chest when flying in rough air.
3. Introduce students to acrobatics gradually.
4. Don't turn your head in steep banks.
5. Keep eyes on horizon when possible.
6. Sit near plane's cg to minimize motion.
7. Stay healthy: correct diet, bowels open.

Brain Leakage—Due to a hydraulic leak in his plane's landing gear, a flight instructor used the CO_2 system to lower his wheels for a landing. The emergency system worked as advertised and, undoubtedly, saved the plane from overhaul.

At this point, however, a leakage of brains developed among the personnel involved, which completely nullified the value of the emergency equipment. The pilot reported loss of hydraulic pressure to the maintenance crew, but *neglected* to report having used the CO_2 bottle. The crew refilled the hydraulic system and then relaxed. They *failed* to check it for leaks, and they also failed to note that the CO_2 bottle had been used.

The results were just what might have been expected. The next pilot to fly the plane also experienced hydraulic failure, and since the emergency system was now out of commission, he had to make a belly landing. The cost of this unnecessary repair bill would have paid the salaries of everyone concerned for a considerable period.

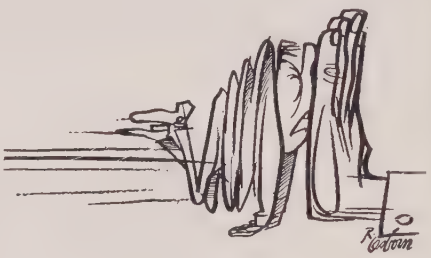


Something to Think About—You are flying a boat-type amphibian at 3,000 feet over farm terrain and your engine conks. Just to complicate the picture, you can't get your wheels down. What type landing do you make?

I know this situation won't confront you very often, but aviators should know how to handle any emergency. Dilbert didn't. When this happened to him, he carefully circled into the wind and dropped her into an oat field with a flaps-up, full-stall landing. The plane stopped with a ripping and tearing of metal in a very violent crash.

This is a much-discussed problem among big-boat pilots. The concensus is that it is all a question of the direction of forces at the moment of contact. If the terrain is such that the hull or fuselage can slide (either soft ground, hard ground, sugar cane, cornfield, etc.) the plane should be flown on (not dropped in) in a slightly nose-high attitude, with flaps and using power, if available, until contact. Successful landings of this type have been made.

If forced to land in an area which precludes sliding, that's a plane of a different color. In that case, it is advisable to jump if you can. If not, pick the best available spot and set her down in the slowest possible full-stall landing.



Just remember, it's the rate of *deceleration* which determines the force of impact. It is much easier on the constitution to hit a wooden cowshed while doing 150 and be stopped in 25 feet than it is to hit a stone wall doing 50. *Use your head and save your neck!*

Foxy Grandpa—For years Dilbert worked on his grandfather to take an airplane ride with him. But the old gentleman was a bit leary—not of Dilbert, but of "them airyplanes." He must be failing, however, for the other day, on his 80th birthday, he broke down and accepted.

Fortunately, Dilbert had a lucky day; nothing went wrong during the 15-minute flight. Dilbert was very elated as he helped his grandfather from the plane.

"What did I tell you! That wasn't bad, was it?"

The old gentleman studied a moment, then replied, "No-o, but I never did put my full weight down."

1. When two aircraft are approaching head on, and there is danger of collision, which has the right of way?
2. How high above a city must you be before you may engage in acrobatics?
3. While over a certain station, you receive and place the current "altimeter setting" on your pressure scale. What altitude will it then show?

(Answers below)

ANSWERS

1. Neither; each shall alter course to the right. This not only according to C.A.R., but also the law of Air Common Sense.
2. Acrobatics are prohibited at any altitude above cities, towns, settlements, or open-air assemblies of persons.
3. It will show your altitude (uncorrected for temperature) above sea level, not your altitude above that airport.

PICTURE CREDITS

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Let's Quit Griping

(*Continued from page 43*)

In five years, if they build 15,000, it might work into a pretty fair airplane.

According to the manufacturer it was a veritable wonder ship. Ten years in advance of its contemporaries. On top of which, it was being sold (it said in the magazine) for less than the wholesale costs of the parts from which it is assembled, to say nothing of the costs of labor, distribution, etc.

We refused to accept a down payment on it to guarantee our ex-Cessna 170 customer the first production model of the new airplane when and if it became available. He stormed off mad and found someone willing to take his money. That was many months ago. I think the Cessna would have paid for itself by now. He is still waiting for his $2500 wonderbar.

Chances are about 50-50 that he may get it, eventually. He might even get it for what they said it was going to sell for—if the manufacturer is so loaded that he can sell them for less than it costs to build them. But that man will not have, for at least many months and perhaps years to come, an airplane that he can use safely and cheaply to do the job for which he needs a plane.

What beats me is this—I talked to a machinery salesman and learned that our ex-customer is considered to be the most level-headed man on earth when it comes to buying equipment for other purposes. He wants proven machinery, with the cost account sheets to show what it will cost him for every hour of operation. Not claims, but facts taken from the service and performance of thousands of these machines while on the job. But he wants to buy a freak airplane he has never seen, because one picture of it was printed in a magazine! What's more, by all that's incredible, he has laid out cold, hard cash on the line that he wouldn't spend many months ago on an airplane he could use now to advantage.

In a way, I feel that it is my fault. Somehow I failed in my job as an airplane salesman. Just why, I don't know. Perhaps he got in touch with a chronic "knocker" who had some other kind of airplane for sale. Regardless of what these "knockers" sell, their only stock in trade is to malign their competitors' airplanes. Often they succeed so well that they not only convince the prospect that he shouldn't buy the plane he had in mind but they drive him out of aviation for good. Perhaps someone like this got our customer on the 170. I've seen it happen on *Ercoupe* sales, *Cub* sales, *Bonanza* sales, *Navion* sales, in fact you name it and someone has been through the same old phony run-around.

The airplanes are all good. They all have special attributes. Some can do one thing best, others are suited for something else. That's how it is in the automobile field after a hundred or so million have been built. You can't buy a 10-ton truck that looks and drives like a Cadillac, has the ton-mile economy of a Mercury, the expense and upkeep of an oak wagon, the speed and pep of an Offenhauser racer, and price of a scooter.

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Acrojets

(Continued from page 24)

rated into the Cuban 8, and as Jonesy Bolt says: "We once slid out and down not too cleanly. But not anymore, Jensen pulls us straight through....," meaning everybody had better do it right the first time, or he won't be around to do it a second time.

Next is a formation Slow Roll off the deck up into a Loop with another Slow Roll on top, then into the Clover Leaf. The latter is a series of four loops with 90° turns on top which sends them in the four cardinal directions.

This maneuver leaves the Acrojets to the left of the crowd. On a new speed run they pull up sharply into a 90° climb. As the airspeed indicator slows down to 300, Jensen says: "Break!"

Whereupon in a lightning flash of wings, the planes Split S, Snap Roll and dive out of the Bombshell in each direction. At the end of the dive the planes are 15 miles apart. Slow-Rolling upgrade—8 G's on the pullout—they form again over the center of the field in about one minute and 45 seconds. Once they did it in one minute and 20 seconds.

The climax maneuver looks exactly like a Fourth of July star-shell.

It is surprising to learn that the pilots seldom talk to each other during the exhibition. Jensen will say "up" or "over," or "right," but that's about all. If something goes wrong, however, a guy will squawk quick. Generally, the show goes through with no chatter on the radio at all.

Except for the Scott AFB episode, and the time in Detroit when Smoe Smolen and Bolt kissed wings at 500 mph under Jensen's fuselage in turbulent air, there have been no serious mishaps. The Smolen-Bolt mishap merely resulted in a broken wing-tip light.

As Smoe says of the Detroit incident, "We gave each other a Mach-1 grin and went on."

But their best tales come from the flights to and from air shows. Cross-country flying has its hazards for jet jockeys the same as for lightplane pilots.

There was the flight to Elmira, N. Y., 2100 miles with only one stop scheduled at Scott for refueling. Scott is 1300 miles from Williams, and the average range of an F-80 with wing-tip tanks is about 850 miles under normal conditions.

When the boys started, they had a big tailwind at 42,000 feet cruising altitude, but it turned into a headwind along the route across New Mexico, Texas, Oklahoma and Missouri. Bolt took two hours and 55 minutes to cover the distance. When Selenger landed at Scott, he had 10 gallons of fuel left—enough for something less than a minute of flying. Fueled again, it was just another hour and 30 minutes across Illinois, Indiana, Ohio and Pennsylvania to New York State.

Then there was the time Smoe "threw a bucket" in his jet engine on the way to Ellington AFB, Texas. Smoe was flying in loose formation with the others when the turbine blade came off near El Paso, 320 miles from Williams.

Smoe called out his trouble, adding ". . . wait for me at Randolph (San Antonio)."

Smolen steered the rattling engine back to Williams, picked up another F-80 and landed at Randolph an hour and a half after leaving the formation.

But the best incident to report was the one that happened to Jonesy Bolt recently. The team was going to Tinker Air Force Base, near Oklahoma City, to put on a show.

Jonesy was cruising at 38,500. In the rare atmosphere he was breathing full supply oxygen and had his cabin pressurized to the equivalent of 18,000 feet. Suddenly and without warning, his plastic canopy disintegrated.

"It blew off my oxygen mask and pieces of the canopy knocked big holes in the wings and fuselage," says Jonesy, explaining that this was as close to the end of it all that he ever came.

"I grabbed the mask back to my face, ducked down to the panel and bent her down.

"Even then, I could feel my eight seconds of normal reaction getting fuzzy and I was nearly unconscious on the way down. I kept remembering something about 5,000 feet, and pulled out at that altitude half way normal. Smoe was on my wing. When I finally looked out, there he was right close with his eyes as big as flying saucers."

Bolt flew the breezy F-80 into Tinker, landed, and then discovered his eye balls had been frostbitten despite the fast descent. At 38,000 feet the temperature is a fairly constant minus 65° C. Tomlinson flew the show in Jonesy's spot.

How did the Acrojets get started? And why do they keep on flying the hot formation despite the fact that they put on their show on their own spare time and cannot accept monetary or other reward for their efforts?

In 1948, their commanding officer, Brigadier General Thomas C. Darcy, a famous wartime fighter pilot himself, attended the National Air Races at Cleveland. He came home displeased with the USAF showing.

He had seen the Navy's famous "Blue Angels." Not a man to be mild with his opinions, General Darcy said the Air Force offering was, in parlance, "stinkin'."

His instructors took the remark as a reflection upon their abilities. In off moments they practiced a few "holding hands" maneuvers of their own. Then they presented a surprise demonstration at a cadet graduation. The general and everybody thought the act was terrific.

As the visiting VIP's and the press spread the word of their ability, the fame of the Acrojets grew. They were invited everywhere every week until there came a time when Major Bolt's wife reminded him she had not seen him one week end for four months.

"Some husbands play golf," Jonesy cracked, because by that time the boys had vowed they would fly themselves into an invitation to the Cleveland show, the top air performance in the land. As it turned out, they were one of the sensations of the National Air Races in 1949.

The press, television, and radio at Cleveland lauded their precision, but had a difficult time describing it accurately, a problem still to be solved. One spectator at Cleveland remarked:

"It's easy to see that those guys have met somewhere before."

A military dignitary said:

"It's amazing that jets can be flown so tight, at such speed and precision and still keep the maneuvers always in sight of the crowd."

That did the Acrojets' hearts good. They will, and have, tied into the "Blue Angels," and want more competitive flying with the

Navy team now that both are in the jets.

"We're a little sharper if they are in the air," cryptically explains Swede Jensen.

General Darcy, of course, was satisfied, but he left Williams for a European tour of duty before the Acrojets really hit their stride. He was succeeded by one of the best military airmen today, Colonel Robert L. Scott, Jr., famed Flying Tiger ace with 13 kills, and author of *"God Is My Co-Pilot."*

With Scott in the front office, the Acrojets had "firewall it all" approval. And Scott, talking of their performance, says:

"Their aerobatics is not something which should be considered as only thrilling. It is an integral part of the training of every fighter pilot. Each aerobatic maneuver plays a part and is necessary to the fighter pilot in accomplishing his goal. That goal is to fly a gun platform with precision, and be able to shoot the enemy from the air."

Now Colonel Louis R. Hughes, Jr., another fighter pilot, is commandant at Williams. He, too, is all out for the Acrojets and is only happy that there is not such easy access to their time.

In talking with the Acrojets, there is none of the Red-Hot-Henry attitude. Usually a "goat" is catching hell from the rest for some deviation of the perfect. Sloppy flying is the worst curse any of them can suffer.

Generally, their talk on precision flying is like a remark Lefty Selenger, whose slot position is the most difficult to fly, made:

"When we are looping with the Slow Roll on top, I'm steering through the Swede's blow wash, and brother, that's the time I start sending an SOS to God."

Their tight formation perfection has raised the question of how they do it at such high speeds. The Acrojets swear they do not know the answer, but the best solution seems to be the word "instinct."

Fighter-plane formation flying—and fighting as a team—is sometimes called "instinct" rather than "planning." Racing close to the point of compressibility does not allow time to think or discuss a maneuver. The proposition breaks down to a comparison with wild ducks always turning in unison and geese flying in Vee echelons. The followers always know where the leader is going.

One point they will quickly agree upon is that the jet is much easier to maneuver than a reciprocating-engine type aircraft. There is no torque, and the speed of an F-80 makes it extremely sensitive on controls.

It is obvious that the Acrojets like their flying despite the hazard—they forewent Christmas excusions to sharpen their repertoire—and their military records also demonstrate a reason why they live to fly.

Captain Tomlinson, for example, has the Silver Star for a fighter mission over Italy in which he and one other American tangled with 60 German Messerschmitts. Tommy got two for sure, and one probable, while his partner shot down two more.

Between the five of them, there are four DFC's for exceptional bravery during the war, and the number of times they have been awarded the Air Medal for meritorious action adds up to 42.

Their origins indicate the way Americans live and fly together. Jensen, the oldest at 33 years of age, is a native of Clark Grove, Minn.; Bolt, a boyish young man of 26, hails from Ware Shoals, S.C. He bailed out of a P-47 over France, and had his earphone shot off by German soldiers. He tried to escape the Bastille in Paris, was caught again, and ended the war as a POW.

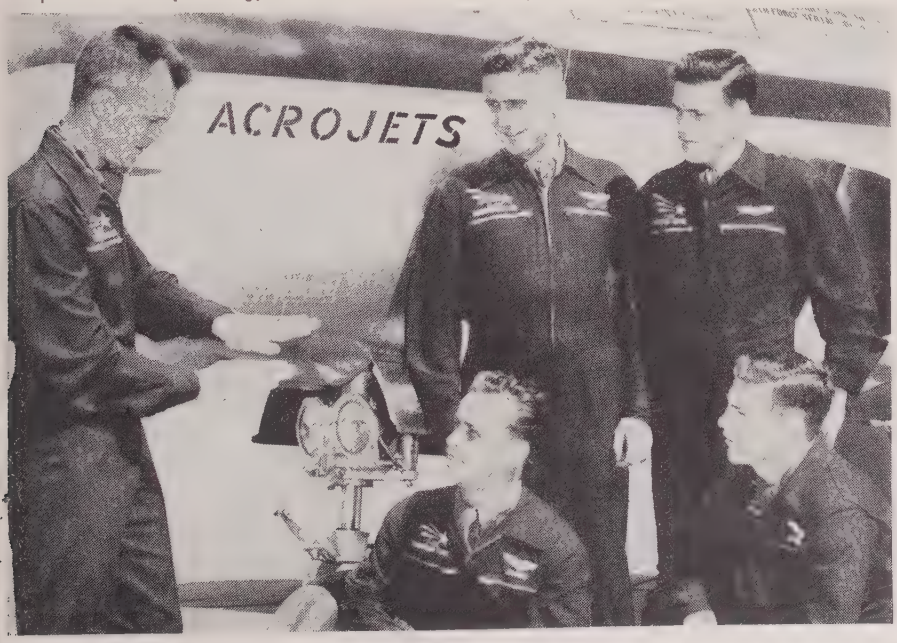
Smolen, 29, a five-foot-two bundle of man who likes to get the other Acrojects kneeling when their pictures are made, is originally from Johnstown, Pa. He also was shot down by the Germans, but made his way back to the Allies via the underground.

Selenger, 32, is the biggest man on the team. He was a school teacher in San Jose, Calif., before he tried on wings during the big shooting. Now he is also the ranking jet pilot in the country from the standpoint of hours logged.

All the Acrojets are married—all have children.

It is clear from their conversations that they consider their sharp performance just another proof that jets are not difficult to fly, even if it means a complete Snap Roll every two seconds. A jet will roll at constant speed as long as the fuel lasts.

ACROJET LESSON in "walking in close" is given by Major Jensen to Major Selenger and Capt. Tomlinson *(standing)* and Lieut. Smolen and Major Bolt *(kneeling)*. Jensen is the leader



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(Continued on page 56)

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(*Continued from page 55*)

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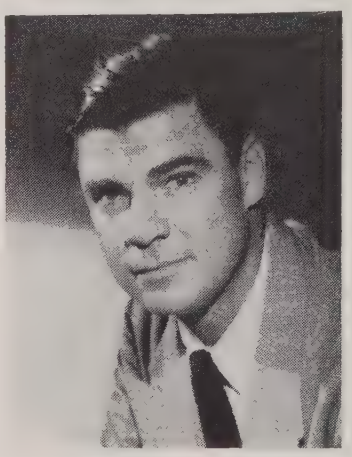

BERT PARKS, m.c. or NBC's Wednesday evening "Break the Bank" radio and television programs, came in for a landing at the SKYWAYS' office recently and tossed a "Break-the-Bank-er" at our pilot readers. Try your hand at it. Score yourself 10 for each correct answer. If you're in the 80 to 100 bracket, you're a Grade A "fly-boy." If you miss a couple and hit the 60 or 70 bracket, you're still okay, but could use a little more flying time. If you come in under 60, watch out! You're about to wash-out!

1. Dilbert says the easiest way to remove ice from an airplane is to pour boiling water over the iced parts.
   ☐ Right ☐ Wrong
2. Ice increases the stalling speed of an airplane because of increased weight and drag as well as increased lift.
   ☐ Right ☐ Wrong
3. Dilbert says to leave cowl flaps open after cutting your engine.
   ☐ Right ☐ Wrong
4. Power of a jet engine increases with speed of flight.
   ☐ Right ☐ Wrong
5. You should circle an airport to the right before landing, unless specific instructions are in effect.
   ☐ Right ☐ Wrong
6. Dilbert says you should turn pilot heat off prior to entering a storm area.
   ☐ Right ☐ Wrong
7. A pilot should increase his rpm in a storm.
   ☐ Right ☐ Wrong
8. In a storm area a pilot decreases his cruising speed in relation to his stalling speed.
   ☐ Right ☐ Wrong
9. According to old pilots, blind flying is trying to stay on VFR in instrument weather.
   ☐ Right ☐ Wrong
10. A license is not necessary to operate your plane's two-way radio.
    ☐ Right ☐ Wrong

ANSWERS TO AIRMEN'S QUIZ

1. Wrong. Water will freeze again and make the condition worse.
2. Wrong. Lift is decreased, not increased.
3. Right. You leave cowl flaps open to prevent damage to plane's electrical system.
4. Right.
5. Wrong. A pilot should circle his plane to the left.
6. Wrong. Turn pilot heat on prior to entering storm area.
7. Right.
8. Wrong. You boost cruising one and a half times stalling speed.
9. Right. Blind flying is trying to stay VFR in instrument weather.
10. Wrong. An FCC license is necessary for operation of two-way radio.

Omni-DME Questions & Answers covered by Pilot-Member of ANDB, Air Coord. Com. . . . Page 61

NAVICOM

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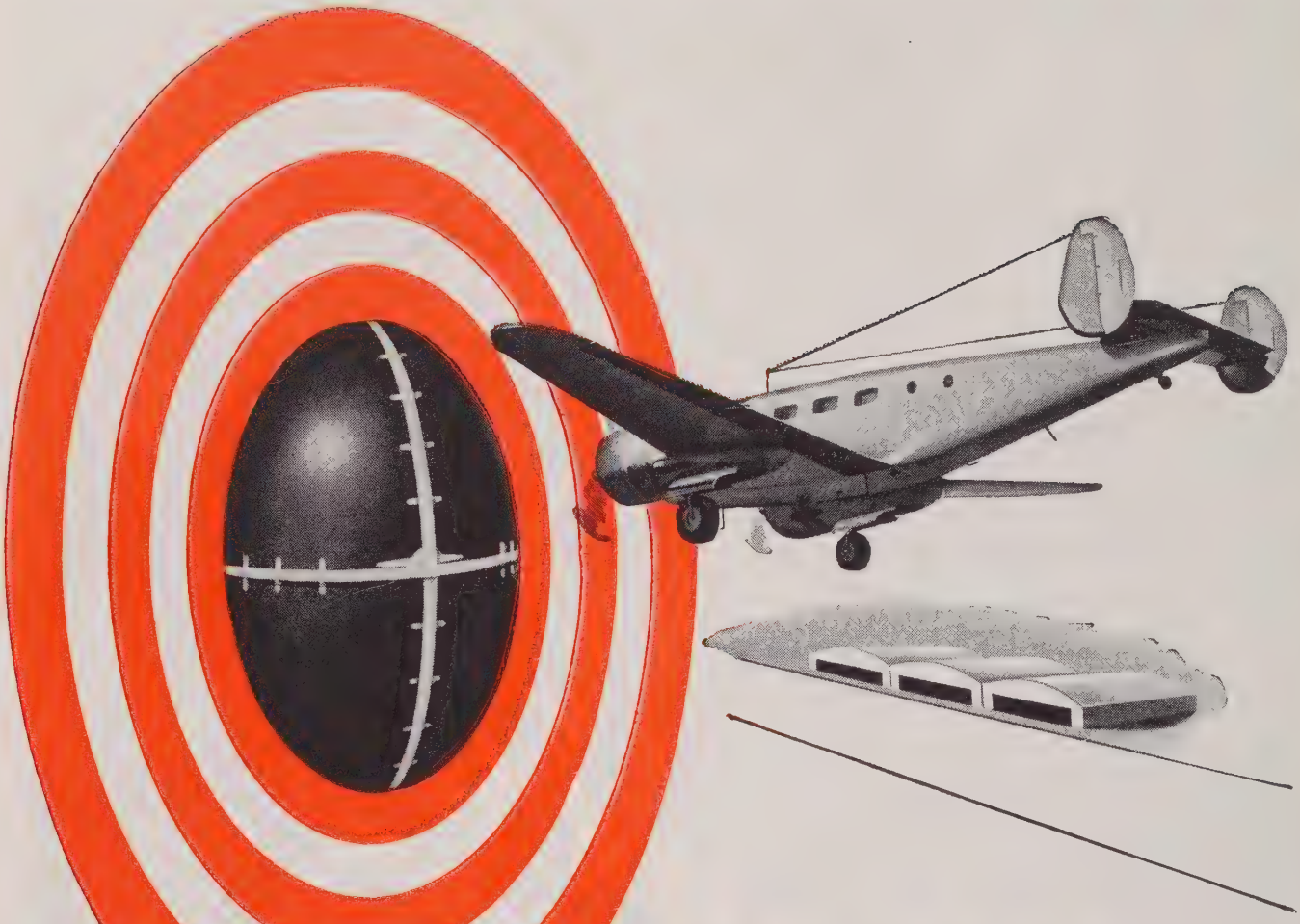
A new-type Runway Marking offers aid to Pilots making landings under Fog conditions . . . page 64

Edited by Col. N. F. Silsbee



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• The Zero Reader supplies information from five essential instruments . . . presents all this data on one indicator—heading, altitude, attitude, and instrument landing information. The pilot merely "zeros" two instrument pointers and is relieved of all complex mental calculations. The difficult task of making a manual approach on Instrument Landing Systems becomes a routine procedure.

• Our nearest district office will be glad to give you full information.

Among the many companies that have purchased a Sperry Zero Reader for their executive aircraft are:

Bethlehem Steel Co.—Lockheed Lodestar
W. K. Carpenter—Beechcraft
Avco Manufacturing Corp.—Lockheed Lodestar
Texas Eastern Transmission Corp. Douglas DC 3
Briggs Manufacturing Co.—Grumman Mallard
Champion Spark Plug Co.—Beechcraft
Gaylord Container Corp.—North American B-25 and Beechcraft
C. F. Kettering, Inc.—Grumman Mallard
Union Producing Co.—Douglas DC 3 and Lockheed Lodestar
General Electric Co.—Douglas B 23
The Fuller Brush Co.—Grumman Mallard
General Mills, Inc.—Douglas DC 3
Signal Oil and Gas Co.—Douglas DC 3
Arthur Godfrey Productions, Inc. Douglas DC 3
Plymouth Oil Co.—Douglas DC 3

*TRADE MARK, PAT. PENDING

SPERRY GYROSCOPE COMPANY

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NAVICOM

Radio Aids For Business Flying

CAOA hears a report on the radio equipment that increases utility of executive DC-3

By ARTHUR GODFREY

Radio favorite Arthur Godfrey won Award for outstanding aviation service

You know, I'm glad to see how this corporation aircraft organization is growing. We all have pretty much the same problems in using these aircraft to get around in carrying on our business, and I think organized we can do ourselves a lot of good.

Today, we had quite an experience coming down to Washington for this Forum. I came down in one of Bill Remmert's DC-3's. They stuck me up in the left-hand seat and gave me my own copilot Frank LaVigna on the right so I felt at home. LaVigna is a wonderful copilot to have. If you start to make a mistake . . . well, my hands are all black and blue where he hit me. It's impossible to make errors with that guy!

▶ **GCA Approach.** We came on an instrument flight plan from Teterboro, and except that they took us by way of Cleveland and, I think, Chattanooga and some other places, we finally got in here okay. And I made a GCA approach which gave me a big kick, although I felt a little foolish when we broke through and it was a bright, beautiful day! I looked up from the instruments and the sun was shining and I could see everywhere, but I tell you that GCA approach was a very comforting thing. I stuck right to what the controller was telling me to do and didn't watch anything but that instrument board all the way down. It's a wonderful feeling to know that if you need it those guys can bring you in. They brought me right down and told me which side of the middle of the runway I was on!

▶ **DC-3 Equipment.** The solution to this all-weather flying deal seems to me to be this stuff I am going to have in my own Douglas. Remmert-Werner of St. Louis is fixing it up now. You may be interested to know just what is going into that ship. I swear, after that equipment is in and it gets to working, if I ever get lost I should never get out of bed again.

It has Bill Lear's automatic pilot for one thing. I have been flying that job now for the last month or so in his Twin Beech. I sold my own to one of our members up in New York state. I have never seen anything work as beautifully as this little autopilot of Lear's which weighs only 32 pounds. The whole deal is small enough to go into a four-place single-engine job.

Then from Sperry, I have a Gyrosyn Compass and a Zero Reader. I have never flown the Zero Reader, but they tell me it's a honey.

There is also a Flux-Gate Compass, two Bendix ADF's, and one VHF-ADF. I have never seen one of those before, but that should be a good deal when there are thunderstorms around.

They are also putting in a Lear *Omnimatic* so I can fly these new omni-range stations. If I ever get lost with that, I give up. And besides, any time you look out of my ship you will find a railroad track right under me anyway. I always like to know where I am and that is the only way I can tell for sure, when I recognize the tracks. Every once in a while someone throws the switch on me . . . I get hopelessly lost.

▶ **Crosswind Gear.** The other day I flew this Goodyear crosswind landing gear. Have any of you ever fooled with that? That's quite a thrill. It's the silliest feeling you ever had in your life. You know how you crab into the runway as you come in crosswind and our technique is always to kick it around and straighten it out just as we get on the runway. Well, with this crosswind gear you don't kick it around. You come in and set it down. It goes right straight down the runway, and your heart comes up in your mouth. You can't believe it, but there it is . . . and it's the silliest thing in the world to have your nose into the crosswind and still be running straight down the strip. I did six landings with it at Trenton. I did one with the wind at 90°. It wasn't very strong . . . in fact, I couldn't get more than about 15 miles of wind, but it worked. This crosswind gear may be a big solution to the one-strip deal for those of us who can't afford big airports.

▶ **Godfrey Airport.** I don't know if any of you have even seen my "International" airport. The tower is on .0005 megacycles if you call, and it is over at Leesburg, Virginia. It's a little cow pasture that I mowed myself and got 1700 feet out of it. Amazingly enough, my DC-3 goes in there using half of the field, going in and coming out. One day about three weeks ago I went in and quite a crowd of neighbors gathered around. They had never seen as big a ship as the DC-3 in there before. After I had shot a couple of landings with it, we took a full load of them out of there, brought them over Washington, showed them the city from the air and then brought them back again. They don't know to this day that they were pioneers! But they all seemed to enjoy it, and I think seven of them said they had never been in an airplane before, so I made seven converts anyhow . . . and what's more, it was fun.

It has been a lot of fun flying these airplanes and all their equipment. Flying is really a great game, and it does a lot for us fellows who use our airplanes to help us in our business, because that encourages other people to do it. That is where this (CAOA) organization can really do a job. Whether some people believe it or not, flying is here to stay. The more people we can make conscious of it by showing them the utility of it the way we do, I think the better it will be for the industry and the better it'll be for our country, too.

New GCA at LG

A new GCA system was commissioned at La Guardia Airport recently. It is the second of a series of eight improved Gilfillan units being installed by the CAA at certain key airports. Los Angeles was the first; New York, second; and Boston, Washington, Cleveland and Atlanta are almost ready.

Nat'l Defense Calls For New Fed. Airways

By Brig. Gen. R. J. Smith

Pres. Nat'l Air Council

The Federal Airways which are now in the process of being superseded by the so-called Transition Program of the Common (military and civil) System, are in all essentials those which were placed in operation in the days of the Ford tri-motor transport. There are tens of thousands of miles *more* of them, but all are still based on the inadequate, static-ridden low-frequency four-course radio ranges.

▶ **Military Requirements.** The types and speeds of air weapons available to the only potential enemy now on the horizon make possible such a rapid and powerful attack on the United States that it is of major importance to our national security to have an integrated air navigation, traffic control, and warning system in a state of readiness.

The swift pace of modern war does not wait for favorable weather; our very existence as a nation might conceivably depend on our ability to move large numbers of aircraft safely and surely to a point under attack, or to a point of departure from the United States.

▶ **Inadequate System.** Possibly the weakest link in our whole national defense chain is the present inadequate air-navigation system of the U.S. In the event of an emergency what would be required is a system of aerial *autobahns* already in operation, along which large numbers of attack bombers and fighters could be moved rapidly and simultaneously to a threatened point in the continental United States. Equally important, it would be necessary to supply these shock forces by air in sufficient volume.

▶ **RTCA Program.** The Transition Program, as laid down in detail by RTCA's SC-31, provides such a system of aerial *autobahns* for both civil and military non-tactical flying (transport operations). For strictly tactical operations, the Armed Forces have certain developments under way independent of the Common System, including UHF radio aids and radar beacons.

The Transition Program, approved by all branches of the military, has been carefully tailored to meet national defense as well as civilian needs. Its main elements include omnirange (VOR), distance measuring equipment (DME), offcourse computers, airport surveillance radar (ASR), precision approach radar (PAR), and last but far from least, high-intensity lights.

A single VOR-DME installation on a beachhead, island, or near a fighting front, meets the navigational requirements for all planes in the area.

ASR and PAR are the two functions of the wartime GCA system, operationally simplified and now available in improved versions with more exacting specifications. ASR allows tower operators to "see" all air traffic for 30 miles around, regardless of visibility, reducing collision hazards and increasing efficiency in handling landings and take-offs. PAR enables air traffic controllers to "talk down" aircraft under low ceiling and visibility conditions.

High-intensity approach lights, extending out from the runways of major airports, are critically important to pilots making approaches under low ceiling and visibility conditions. With their aid, the pilot can glimpse the ground and make the transition from instrument to visual flying several vital seconds sooner than would otherwise be possible.

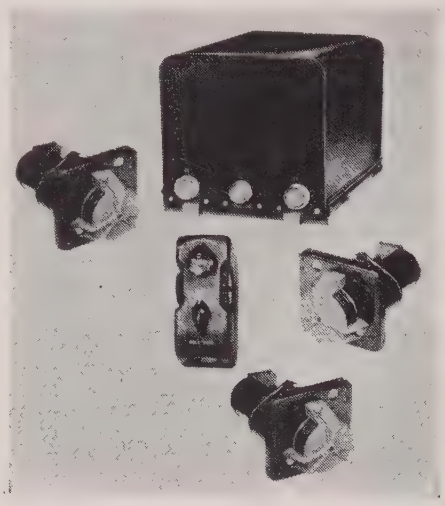
▶ **CAA Responsibility.** The responsibility for installing and operating the common military-civil system falls primarily upon the Civil Aeronautics Administration's Office of Federal Airways. Congress must appropriate the money to carry the carefully worked out plans through in detail and on time.

For air navigation facilities in the 1951 fiscal year program the Budget Bureau recommended $69,961,500. The House Appropriations Committee then slashed this to $45,561,000, a cut of $24,400,000.

Economy is a fine thing, but in the light of today's international situation this emphatically is *not* the place to exercise it.

Lear Autopilot

This lightweight autopilot, designed for the USAF, has been one of Bill Lear's pet projects for some time. He has been test flying various versions and development models since early 1945. Its present basic function is the reduction of pilot fatigue. Scheduled installations include the Northrop F-89 *Scorpion* and North American F-95, both classed as all-weather fighters. It is also adaptable for civil flying, per Arthur Godfrey's testimony (*page 59*). . . . . .



Through proper manipulation of the flight-controller knobs, the F-5 autopilot will do the following:

(1) Maintain the aircraft in straight-and-level flight on a magnetic heading.

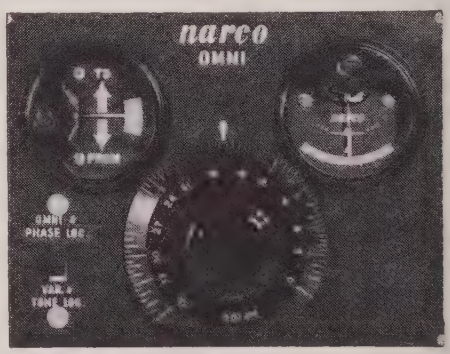
(2) Permit climbs and/or dives of plus or minus 20° from level flight.

(3) Permit coordinated turns up to a maximum bank angle of 40°.

All necessary adjustments for the operation of the autopilot are centered in the flight controller (center of photo) which is mounted in the cockpit, while the reference gyros and all necessary amplifiers have been remotely placed in the three-axis control container. Lear is tooling up for F-5 production.

Cessna Owners Offered NARCO VHF-Omni Unit

All Cessna models (the 140, 170, 190 and 195) can now utilize a very neat, compact panel for installation of the National Aeronautical Radio Company's omni-range receiver (see photo), with VHF communication set. The NARCO



unit fits into the space normallly occupied by one of the small two-way radio sets.

Cost is about $770.50 installed, and includes NARCO VHF transmitter-receiver, omni-range receiver, antenna, headphone, microphone, speaker and shielding.

Private Pilots' Radio Tix To Be Checked By The FCC

Private pilots who have been operating radio transmitters without a license for both equipment and operator should carefully read Public Notice 50774 issued on May 31 by the Federal Communications Commission. A copy may be obtained from the FCC, Washington 25, D. C., or from the nearest field office. These are located in Boston, New York, Philadelphia, Baltimore, Norfolk, Atlanta, Savannah, Miami, Tampa, New Orleans, Mobile, Houston, Beaumont, Dallas, Los Angeles, San Diego, San Francisco, Portland (Ore.), Seattle, Denver, St. Paul, Kansas City (Mo.), Chicago, Detroit and Buffalo.

Pilot Answers Omni Questions

In RTCA Assembly talk, an ANDB member reports on the capabilities of the Transition Program

By COL. S. A. MUNDELL
Air Navigation Development Board

As a member of the Air Navigation Development Board, I think that the Transition System represents a great step forward in providing aircraft operators and traffic controllers a much simpler and more flexible system of navigation and traffic control than the one which we have been used to.

We're still short of the goal which was set up for us, but as we become accustomed to the new system and its operational capabilities, we will certainly improve its operational use.

▶ **System Tests.** Speaking as a pilot, I have been spending quite a bit of my time in going from place to place, either telling people about the system or observing tests on the various components of the system. Thus I have had many opportunities not only to fly the new gadgets but also to talk with people regarding the various aspects of them.

Almost always the first question which comes up is, how do you fly the VHF Omni and how do you like it?

▶ **How Do You Fly It?** The answer to this is very simple. All you do is tune the station in; turn the course selector until the TO-FROM needle reads TO and the vertical needle is centered; read the heading to the station on the course selector; turn to that heading, and fly to the station.

It must always be borne in mind that the VOR, like the localizer of the ILS, indicates displacement from the chosen course and that this displacement must be used in conjunction with some heading device before the system can be flown properly.

If you tune in a station, say 40 miles away, and by centering the cross-pointer needle establish a course to that station, it is entirely possible to make a complete 360° turn without having the vertical course pointer needle ever leave the center of the dial.

That's why the radio magnetic indicator was born. It points to the station at all times, and that's why the Air Force added a heading needle to its combined course selector-deviation indicator (Bendix equipment).

▶ **Do You Like It?** As to how I like to fly the Omni—it's so easy to fly that I find myself becoming rusty on flying the old four-course low frequency ranges.

Then I'm often asked, how does the Omni work in small aircraft? From personal experience I can say it works fine in CAA's *Navion*.

How does it work when there are thunderstorms around?

Personally, when it looks as though there might be any thunderstorms in the vicinity, I prefer to stay home!

However, Colonel Al Key told me about a recent flight from Wright-Patterson to Meridian, Mississippi in which he had so much static—also a lightning strike—that his L/F equipment was unusable. However, he was able to use VOR during the entire flight.

▶ **Distance Measuring.** How about the DME, and when are we going to be able to fly that?

Frankly, there isn't a thing to flying on the DME. It simply sits there and cranks out distance to the Omni station.

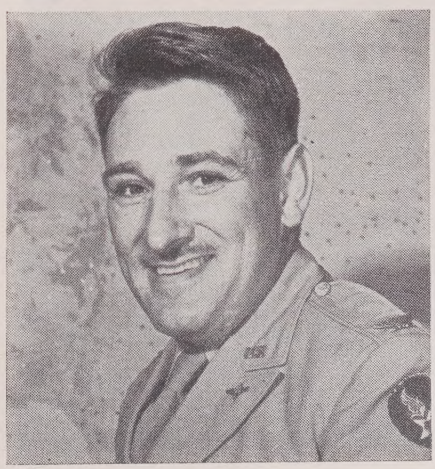
And it's a rather comforting feeling to watch the VOR say, "Here's the way to get to the station," while the DME says, "And now you're this far away."

▶ **DME Available.** When will DME be generally available? There are a few experimental VOR-DME stations now in operation, contracts have been let for the ground equipment, with scores of installations set for 1951-52, and the airborne sets will be ready by the time the first DME beacons are in operation.

From the traffic-control angle, the installation of VOR and DME in the aircraft will enable pilots to keep the air-traffic people informed of their whereabouts whenever they ask those somewhat embarrassing questions that they seem to love to pose: Where are you now and just when do you propose to be at such-and-such a place?

This ability to tell them where you are will greatly relieve their burden and, since they know your location, it will enable them to dispatch other aircraft more quickly without causing unsafe conditions to arise.

Col. S. A. Mundell, AF member of ANDB



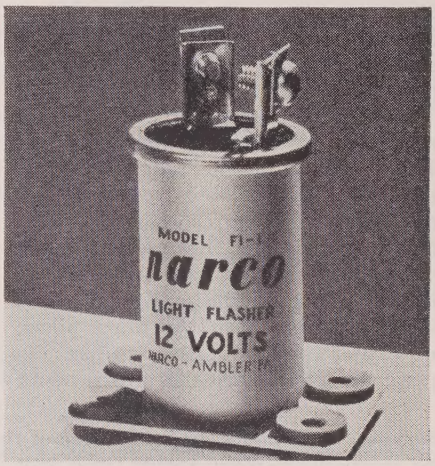
▶ **System Error.** How about shortcomings in the system?

We have found error in the Omni-Range of about plus or minus 3°, and that the errors in airborne Omni receivers vary from plus or minus .75° to plus or minus 3°. We have found that the DME inaccuracy is about one-half to 3 per cent of the distance measured.

Thus, while we can take some satisfaction over what has been accomplished to date in the Transition System, we are also beginning to find out what is wrong and what has to be done to bring the system up to the standard which has been set. Knowing where we now stand will allow plans to be made so that the next step will be in the right direction.

Lightplane Flasher

National Aeronautical Corp. of Wings Field has developed the NARCO Flasher for personal and executive aircraft with



gross weight below 12,500 pounds. This single-circuit flasher has been proven by exhaustive field tests and weighs only 2 ounces. Price is $9.95 with installation kit. It can be installed in all aircraft operating with 12- or 24-volt systems.

According to NARCO engineers, the Flasher meets all specifications as outlined in the recent CAB draft regarding mandatory installation for all aircraft flown during hours of darkness.

New Collins Equipment

The Collins 560-A-1 Parallel Course Computer is a new device which will provide course five miles apart up to 30 miles from any desired track for parallel course work. It is actually a DME unit or R-Theta Course Calculator and fits nicely into the next stage of the Transition Program.

VOR-DME versus Airborne Radar

Minority reports show some pilots prefer microwave radar to VOR-DME

By COL. N. F. SILSBEE

It would have been a miracle of the first order if the hundreds of scientists, engineers, radio technicians, air traffic controllers, pilots, Armed Force experts and government officials who worked for over two years on RTCA's SC-31 had reached the same major conclusions for the new airways. As it was, substantial agreements on many important points were reached, and a considerable majority was finally won over to the R—θ system (R for range, *theta* for azimuth), which is the backbone of the Common System of Air Navigation and Traffic Control. Hence the current large-scale program of Omni-ranges and Distance Measuring Equipment.

▶ **X-Band Preference.** There remained a group of very able radio engineers, test pilots, airways men and military officers who were convinced that microwave radar (X-band), as developed during the war, could do all that was claimed for the R—θ scheme, and a lot more besides.

By the use of airborne radar and radar beacons (racons) which show up as coded pips on the radar screen in the cockpit, the pilot is free to fly any course of his own choosing, as with Omni. In addition, however, with his airborne radar set he can "see" converging air traffic in the area and knows that he is also "seen" by other pilots, no matter how soupy the weather. Experienced pilots insist that this is better than having someone on the ground tell them about it—an operator who "sees" air traffic by means of his Airport Surveillance Radar set.

X-band airborne radar has also proved its ability to "see" local storms ahead; storm clouds show up as bright areas on the PPI scope. Circling around these often means avoiding icing conditions as well. Its use as a warning against mountains or other en route obstacles is also to be considered.

▶ **Racon Installations.** During the war a number of X-band radar beacons of the CPN-6 type were installed along the Atlantic and Pacific coasts, and most of them are still being operated by the Coast Guard. Since 1947 many more such beacons have been located at Air Force Bases and Naval Air Stations across the country, establishing a coast-to-coast radar beacon route. It is now being planned to install "racons" at many of the VOR-DME stations so that it will be possible to have your Omni cake and the Radar too!

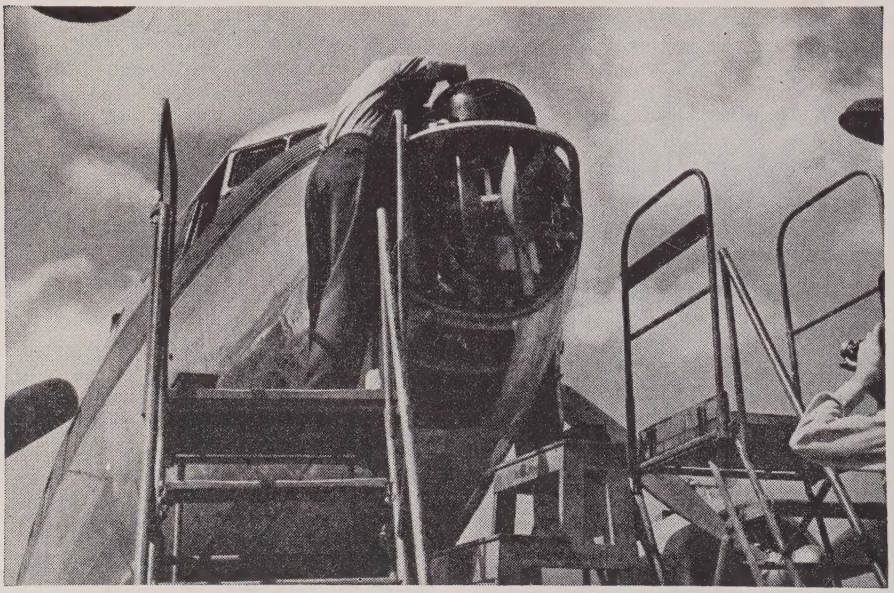
▶ **Radar Sets Available.** The airborne radar sets involved include the Houston Corporation's AN/APS-42, and the Allison radar. The Houston set is a somewhat lighter (270 pounds) version of the General Electric wartime APS-10 (400 pounds), with which American Airlines has done considerable pioneering in airborne radar since 1946.

The Allison ES navigational radar is a lightweight (58 pounds) gyro stabilized unit, the 63-pound ESB model providing radar beacon range up to 150 miles.

Some of the airlines may eventually use radar for air navigation techniques.

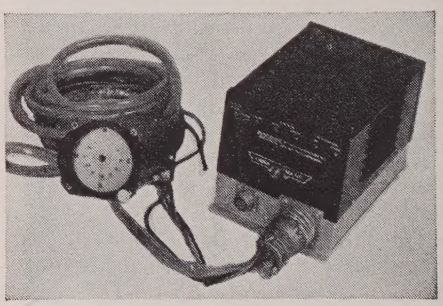
There is a lot to this story, much more than we can get into a short piece in one issue of *Navicom*. We will try to keep you in touch with this concurrent development, including a very important Air Force angle in the high level Air Coordinating Committee which may tend to restrict extension of Omniranges in the eastern section of the country.

Airborne radar mounted in the nose of the plane enables pilot to "see" converging air traffic in the area. X-band radar also "sees" local storms, mountains ahead, etc.



Personal Plane Omni

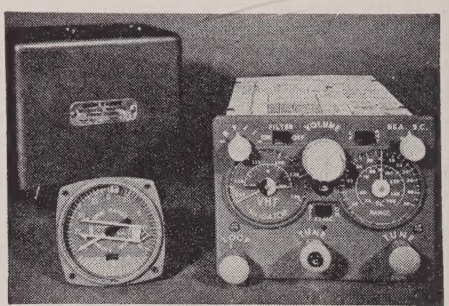
Shown here in the photo below is the Lear Omnimatic System Power Supply for VHF Receiver, Transmitter, and the Omniscope (*left*). This power supply pack comes in 12 or 24 volts. A valuable safety feature of the Omniscope is that if no station is being received, or if a station other than an omni-range station is tuned in, there will be no indication. Tune in and omni station . . . and the scope comes to life. Cost of complete Omnimatic system, is below $800.



VHF For Lightplanes

Latest of the omni sets for the private pilot is the 1950 Mitchell VHF Avigator (*below*), with its newly developed Omni indicator (center), and power pack. The left-hand dial on the Avigator transceiver set indicates a VHF transmitter and tunable VHF receiver in the 108 to 132 mc band. Dial at right indicates 200 to 400 kc range receiver (outer circle) and standard broadcast frequency directional loop and azimuth (inner circle). Small switch in center is for 75 mc marker beacon receiver.

Price of the complete Avigator set, with Omni indicator, installation kit and antenna is $635.



Progress Report

Navigational facilities are keeping pace with increase in air traffic

By SAM SAINT
Dir. Air Nav. & Traffic Control, ATA

We stand in the middle of the most interesting era in the history of aviation. In the past eight years we have seen air transports grow from 12 tons to 70 tons. Cruising speeds have gone up from 170 to 330 mph. Our pressurized cabins carry passengers and crews comfortably 18,000 to 25,000 feet above the highest mountains and above the ordinary vexations of weather.

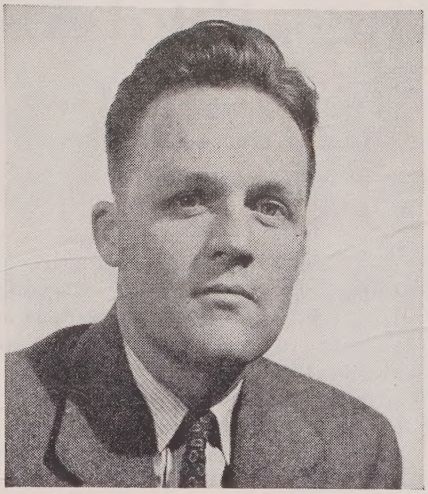
▶ **Airline volume up**—These improvements and other factors have combined to build up the volume of airline business to six times its prewar level. This has given rise to new problems in both air navigation and traffic control. The U.S. scheduled airlines have set a goal at moving 3600 passengers per hour in and out of a dual runway airport in weather thick enough to slow highway traffic. We in the Air Transport Association see attention being focussed on this problem from all quarters, and we are sure that as the new Common System of air navigation and traffic control (so named because it will serve both civilian and military aviation in the common cause of national defense) will make this goal possible.

▶ **New Equipment**—Navigational facilities are in the process of putting on a new look. The VHF omnidirectional range is replacing the old and static-ridden low frequency range. Instrument landing system and ground radar are no longer things we brag about in the press and argue about in committee. We are now using these new tools to get us there faster and safer in worse weather.

Real, honest-to-goodness approach light systems are finally being installed. Approach lights reach out along the approach path to lead a pilot visually out of the clouds onto the runway. CAA is now going full steam ahead installing approach lights with the real horsepower to do the job.

Improved versions of the familiar GCA or Ground Controlled Approach radars are now going into service. These Precision Approach Radars have a very high resolving power. The operators watch the progress of airplanes approaching runways through clouds. They warn of unsafe conditions and "talk down" airplanes unequipped with the instrument landing beam receiver.

During 1949 the scheduled airlines made nearly four million landings and take-offs. But we cannot rest on our laurels. As we put new electronic marvels to work, we need to redouble our efforts. There is much to be done.*



Sam Saint, American Airlines, ATA

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* Condensed from an address by Mr. Saint, Director of Air Traffic Control and Air Navigation, ATA, at the spring meeting of the ASME.

Be Sure of your Pips

The next logical step in the airport surveillance picture is a method of obtaining fast, positive identification of the aircraft represented by the pips moving across the face of the PPI scope. This is done by VHF-ADF equipment already developed. It will do away with executing time consuming turns.

CLEAR COMMUNICATION
OMNI NAVIGATION
WITH A.R.C. VHF EQUIPMENT

Fly Directly in Less Time— Keep All Signals
STATIC FREE!

Get static-free communication and the added reliability of omni range navigation by installing A.R.C.'s Type 17 2-way VHF Communication and Type 15B Omni Range Navigation Equipment. With the 15B tuned to the VHF omni stations now covering the country, you fly directly in less time. You can receive weather broadcasts simultaneously with the navigation signals—*static free!* The 15B takes the work out of navigation and provides long, trouble-free life. The Type 17 provides an independent communication system for use while the 15B is busy providing navigational information. Other A.R.C. equipment provides LF range and broadcast reception, and rotatable loop navigation.

All A.R.C. Airborne equipment is Type Certificated by CAA. It is designed for reliability and performance — not to meet a price. Installations for both single and multi-engined planes are made only by authorized service agencies. Write for further details or name of your nearest A.R.C. representative.

ARC
Aircraft Radio Corporation
BOONTON, NEW JERSEY

See SKYWAYS Sept. issue
for a pilot's report on the new two- and three-control Ercoupe for 1950
On sale: Aug. 8

Learn How To Fly The
OMNIRANGE!
GET THIS NEW BOOK
"FLYING THE OMNIRANGE"
by Charles A. Zweng

You've heard and read about the new Omnirange stations which are now being established by C. A. A. on the country's civil airways.
Will you be a pilot who knows how to fly the Omnirange?
Send today for the first and only book of its kind—"FLYING THE OMNIRANGE," by Charles A. Zweng, which tells and shows you exactly how it's done.
In addition to Omnirange, this book also covers other new electronic navigation facilities. These include Distance Measuring Equipment and Course-line Computer which, together with Omnirange, are so radically altering the whole pattern of air navigation and traffic control.
Text is written in clear, easily understood language from the pilot's point of view. Appendix contains complete set of study Questions and Answers. Fully diagrammed, illustrated, indexed. Only $4.00. Send check or money order to address below.

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Runway Markings Pilot Aid

British-developed system of runway marks add to safety in flight operations under fog conditions

By RALPH W. BROWN

A new idea to aid pilots in that "last 100 feet" of a bad-weather landing is taking hold in the U.S. It is the painting of bold marks on instrument runways to give the contrast and "texture" necessary for pilots to judge their height, distance, and altitude by natural visual processes.

The first scientifically marked runway in the U.S. was established at MacArthur Airport, Long Island in May. The installation was made by the Flight Research Department of the Sperry Gyroscope Co. as a tool to aid low-visibility landing research.

Markings of this type were first tested by the Empire Flying School at Hullavington, England. Now the RAF is marking runways at Farnborough and Woodbridge, and London Airport may be marked this Fall. Here in the States, the CAA and Port of New York Authority, it is reported, plan to try similar markings experimentally on the instrument runways at Newark and N.Y. International (Idlewild) Airports.

The marking system at MacArthur is a modification of a scheme devised by E. S. Calvert, British civilian scientist on illumination with RAE (Royal Aircraft Establishment) at Farnborough, whose ideas on airfield lighting have gained wide acceptance in England. His work since the war has resulted in the Calvert system of approach lighting currently used at London Airport and at all airlift terminals in Germany.

Modified Calvert markings at MacArthur consist of four large cross bars, a center line, edge lines, and guide lines. Cross bars, which consist of groups of six-inch stripes, are spaced at 500-foot intervals along the first third of the runway. Each cross bar differs in size. The largest, made up of five six and one-half-foot blocks of stripes 50 feet long on each side of the center line, marks the threshold of the runway. Remaining cross bars serve as distance markers and consist progressively of three blocks, two, and one 40 feet long on each side of the center line.

Calvert's system is the result of a scientific study of just how pilots see and react to what they see during the final stages of an approach. The study goes back to the physiology of the human eye, what the eye must supply to the brain in order for the pilot to line up his plane, flare out, and touch down on the runway.

Although various marking schemes, such as single and double center lines, have been tried out on experimental runways in the past and are in use at certain U.S. airports today, Calvert's system is the first all-out attempt to give pilots all of the data they would normally receive during a clear contact landing. This seems to be the kind of thing pilots have been robbed of through the use of most approach aids.

In fog, the pilot lives in a lonely world somewhat like a frosted plexiglas sphere. The radius is equal to his visibility. Since downward vision is cut off by the windshield, the sphere is more like a frosted dome. His field of vision is limited to the few hundred feet directly before him, sweeping only a few degrees to each side. His world is moving forward at more than 100 mph and, as he approaches the ground, objects which come into view are presented to him suddenly and momentarily. Thus in fog landings, the runway—and any visual aids before it—present themselves suddenly. Visual aids should, therefore, be designed to produce a natural and immediate response in the pilot at first glance.

Landing on the average runway in visibilities of less than a thousand feet is something like landing a seaplane on a large stretch of glassy water. The pilot has no idea of how high he is. Five hundred feet looks the same as five feet. Result is the pilot spends a long time feeling his way down to the surface. This situation is not too troublesome for seaplanes if there is enough water space. But landplanes run out of airport runway very quickly by this process. It is the cause of many go-arounds in bad weather.

The problem to the seaplane pilot disappears if there are ripples or objects on the water to give it "texture." As the plane gets closer to the surface, the texture begins to resolve into detail. Detail becomes greater as altitude decreases. This is the mechanism through which pilots judge height. The same thought applies to night landings on a grass field illuminated with flood lights.

Blocks of stripes painted on a runway give the same useful texture as grass or ripples on water do. The blocks resolve into stripes as the airplane nears the runway.

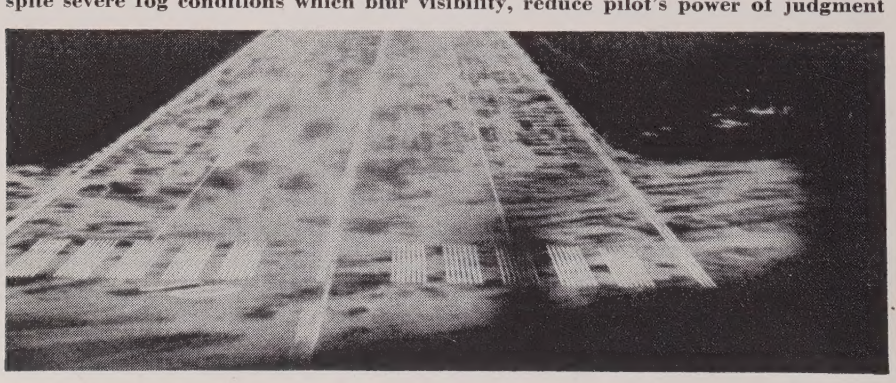
Since fog deprives the pilot of his natural horizon, this data should also be provided in a marking system. For this reason the blocks of stripes are arranged to form bold cross bars from which roll-information can be readily perceived.

Distance information is presented by the distinctly different cross bar seen as the plane progresses along the runway. The largest block marks the threshold so the pilot can avoid landing short of the runway. Also the distance markings run only for the first third of the runway. Most commercial aircraft must be put down on the first third of a 5,000-foot runway in order to have enough space to complete the landing.

The pilot, whether he realizes it or not, normally stares straight ahead during the last part of his descent and becomes conscious of his height and direction by noting the world streaming past in the "tail of his eyes." As the pilot stares, the guide stripes blob through his field of vision and produce streamers or blurs in the "tail of his eye." The tail of his eye, or as medical men call it—the "parafovea," is the outer ring of the retena which is extremely sensitive not only to motion but also to symmetry of motion. Thus, when heading changes, the streamer pattern becomes unsymmetrical and a marked response is produced in the eye. The cross bar and distance markers add to this effect.

The parafovea also contributes to the judgment of height because it is sensitive to the speed of the streamers. Speed of the streamers is directly proportional to ground proximity. Any runway markings which produce streamers aid in judging height.

White stripes on runway enable pilots to judge distance, make safer landings despite severe fog conditions which blur visibility, reduce pilot's power of judgment



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